THE IRON AGE

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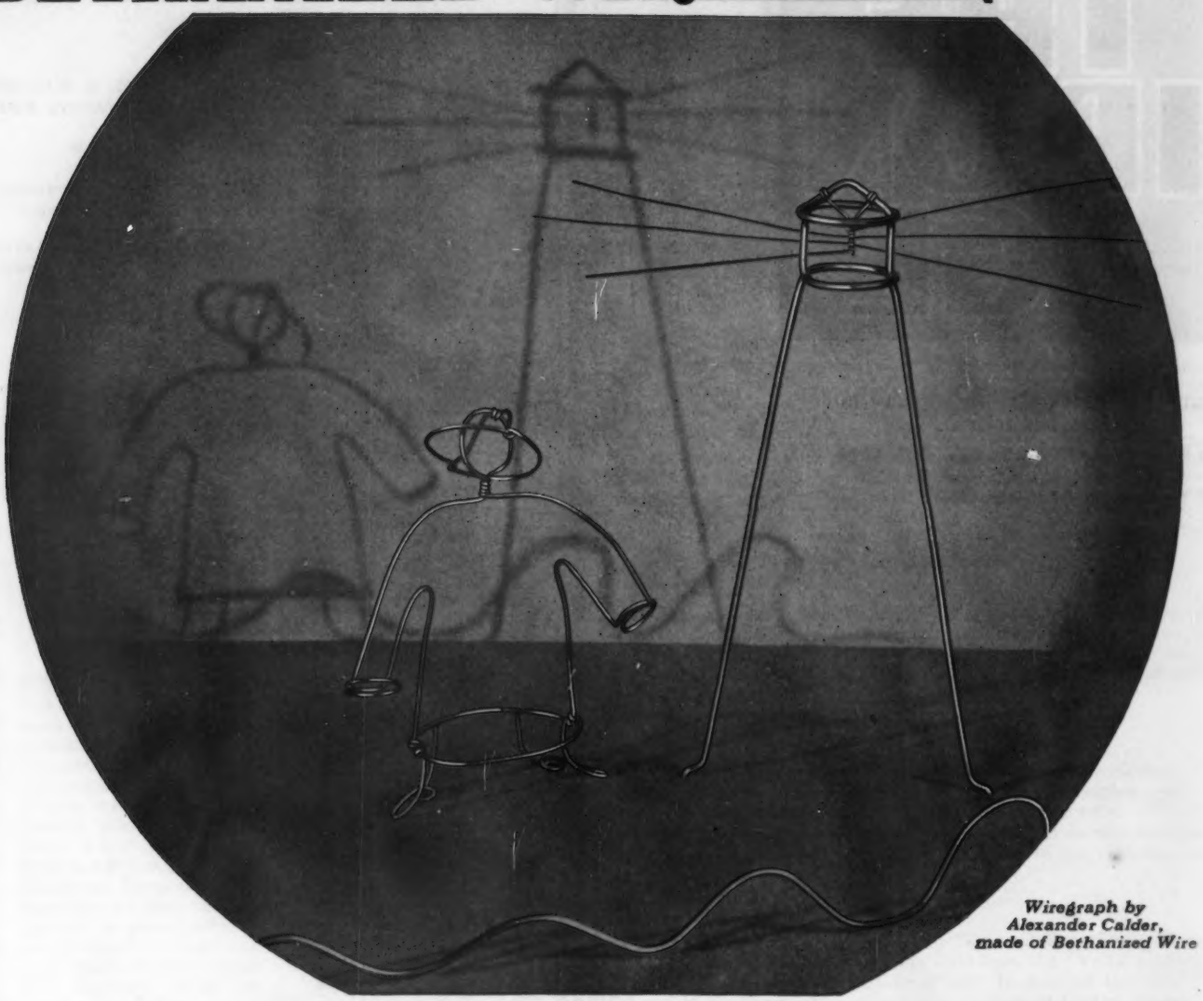
BETHANIZED WIRE



Wiregraph by Alexander Calder, made of Bethanized Wire

To combat corrosive salt air

FENCES, strand and other zinc-coated products made of Bethanized Wire are better able to withstand the corrosive attacks of salt air. In fact, wherever corrosion is involved, Bethanized Wire will give far longer service than the conventional hot-galvanized product.

The longer life of Bethanized Wire under corrosive conditions is due principally to the heavier zinc coatings which Bethanizing makes possible. When desired, the Bethanized coating can be made two, three or more times the weight of hot-dip galvanizing. The zinc is applied by an electrolytic process, and differs both physically and chemically from ordinary galvanized coatings. It is not only heavier but is the purest zinc ever produced and has a bright, silvery lustre. It is tougher, more uniform, more ductile, and more adherent to the steel base.

Even with the heavier coatings, Bethanized Wire can be spiral-twisted, wrapped around its own diameter, even bent back flat on itself, without injury to the zinc coating. It easily withstands weaving into chain-link fence, thus making possible fence with a heavier and more uniform coating than could ever be produced by the galvanized-after-weaving process.

The unusual qualities of the Bethanized coating open the way to the application of zinc-coated wire to new uses. Bethanized Wire is being used for twisted wire brushes, for springs, for bicycle and baby-carriage spokes—and for a host of other uses in which the heavier coatings, improved appearance, higher ductility, and other advantages contribute to a better, longer-lasting product.

BETHLEHEM STEEL COMPANY

GENERAL OFFICES: BETHLEHEM, PA.

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JULY 18, 1935

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"Time for Complacency Is Over"

An extract from an address by Charles E. Brinley, president, American Pulley Co., before the Annual Meeting of Machinery and Allied Products Institute.

IS it not time to strip off the mask and cease prating of reform and those good intentions with which hell is paved? Let us accept the truth, face the music and realize where we are going and what we have to fight. The time for complacency is over. Men have been so comfortable and so rich and so secure in this country for so many years that even now it seems impossible to make them understand and appreciate what is going on before their very eyes. If this Administration has its way, we shall be no better than puppets dancing upon strings.

The program is plain enough to see for anyone who will take the trouble to read it. It involves a complete revolution in our social and economic structure; a gradual destruction of capital and the opportunities which capital provides, a forced disintegration of large units into small ones, less able to protect themselves and therefore more easily controlled, and a so-called distribution of wealth which actually and in fact is a distribution of poverty. A powerful centralized Government with a great bureaucratic following which will carry out the orders of the sovereign and man the political machine, and finally, a heavy curtailment of those privileges of personal liberty which for 150 years have been the attribute of American citizenship. Every sign points down this road, a road which you will travel unless you realize the danger and dig in your toes, for great forces have been unloosed. The propaganda machine which the Government controls, paid for by your money and mine, is unlimited in extent and vast in the power of its persuasion. Class hatred has been deliberately cultivated in this country which before now knew no class distinction and the majority of the Congress has shamefully surrendered to the will of the President, the members voting often contrary to their own convictions because of fear for their political lives or because otherwise their constituents may be deprived of a share of the "pork."

Gentlemen, this is a sorry situation to find in a once proud, prosperous and self-reliant nation. The pity of it is that it has all been so utterly unnecessary, so wasteful of the products of human endeavor, and so destructive of national morale. If we may judge by the experience of other countries and by the history of our own in former depressions, we should have, by this time, been far on the road to prosperity, had we only been allowed to employ our wits and resources in the old familiar ways. Civilizations are a product of evolution and the man who attempts to change them over night to suit his whim is playing with the lightning. The bill, when the accounting is made, I predict will be a heavy one.

Methods for Checking Gears—I

PRINCIPAL requirements to be considered in the production of accurate gears are outlined, and a few devices for checking individual gear tooth elements are illustrated and described in this abstract of the first part of the authors' paper, presented at the recent annual meeting of the American Gear Manufacturers Association. The second part, devoted to automatic inspection of all errors in combination, by means of a recording machine, will be included in a forthcoming issue.

Presentation of the paper included Jones & Lamson comparator projection of actual gears having definitely known inaccuracies. Red liner inspection of the same gears were shown by slides in illustrating the inspection of all errors in combination. The desirability of smooth finish on the working surface of the teeth and a few of the methods of lapping after heat treatment were also discussed briefly. Mr. Hamilton is associated with the Fellows Gear Shaper Co. and Mr. Beardsley with the Jones & Lamson Machine Co., both of Springfield, Vt.

o o o

GEARS are employed principally for transmitting motion from one shaft to another, and to successfully fulfill this function, the tooth action must be smooth and continuous, requiring: that the line of action be longer than the base pitch; that the teeth be evenly spaced; that the mating tooth shapes provide conjugate action; that there is no interference; and that the contacting tooth surfaces have a smooth finish. These are the principal requirements that must be considered in the production of accurate gears.

Elaborating on these requirements: the teeth should be of sufficient length to assure a line of action which is equal to or greater in length than 1¼ times the base pitch. The proportions of this tooth element are a matter of design, although certain manufacturing errors, such as: too much tip relief, irregular tooth spacing, errors in gear mounting, etc., can defeat its successful attainment.

Uneven tooth spacing causes the driven gear to alternately accelerate and decelerate as the mating teeth come into and go out of mesh. In other words, the motion is not smooth and continuous.

Tooth shapes which do not provide conjugate action have a simi-

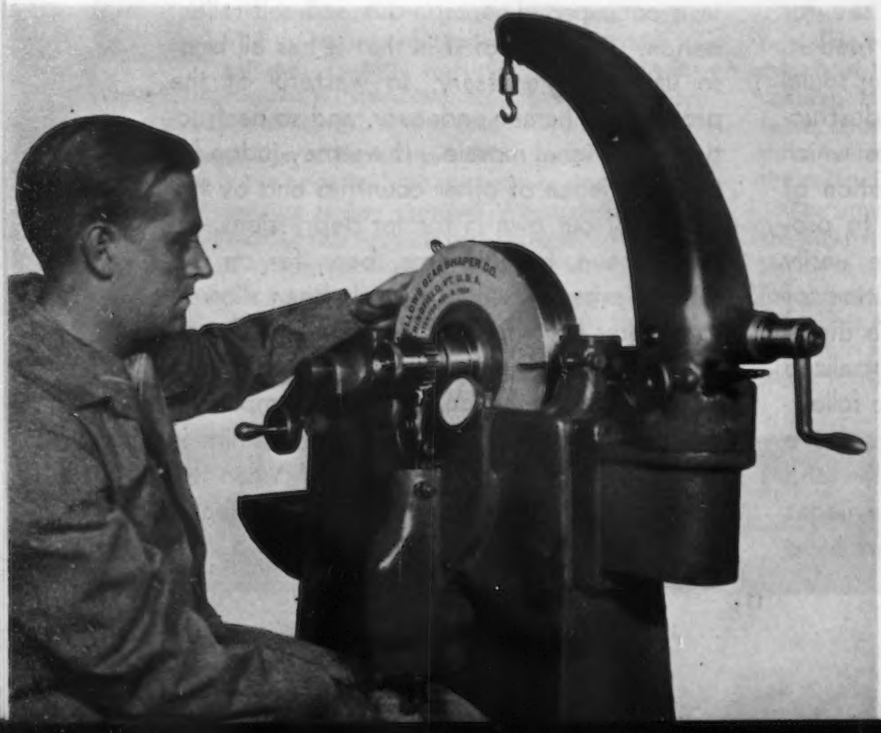

FIG. 1—Involute testing machine.

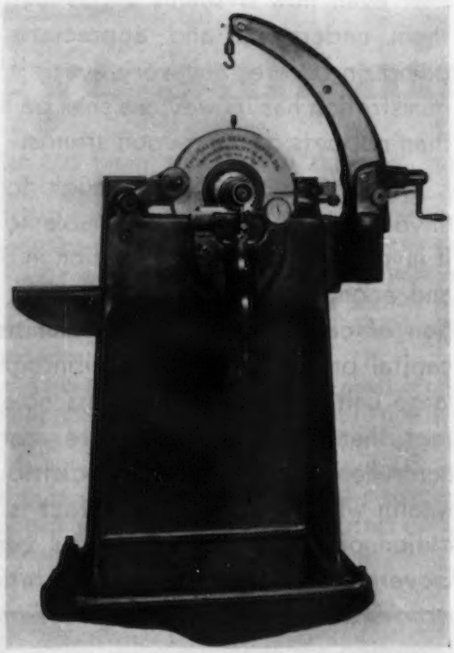

FIG. 2—Close-up of involute tester. Two cylinders of the same diameter as the base cylinder from which the involute is generated roll on two straight edges attached to the pedestal. They are held on an arbor and a head is provided to facilitate rolling in the manner shown.

By DOUGLAS T. HAMILTON and
ROBERT BEARDSLEY

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lar effect, and this is especially so if the active profile is not of sufficient length to obtain a line of action that is greater than the base pitch.

Interference is contact of the teeth at some other point than along the line of action and can result from improper tooth design, inaccurate cutting, and the mounting of gears at shorter center distance than that intended. It is a serious source of vibration and hence contributes to noisy operation.

Methods for Checking Gears

The method best suited to checking gears is governed to a large extent by requirements. These can be divided into two distinct classifications:

1. Checking an original design to determine if specifications have been adhered to, which would comprise principally a check on the individual tooth elements.

2. Checking gears when produced in quantities, where manufacturing tolerances must be adhered to and errors are considered in combination rather than separately.

Obviously, if only one gear of a kind is to be made, it would be treated in the same manner as an original design and separate checks would be made on the various elements. If, however, the gear was to be produced in quantities, then devices capable of determining accumulative errors would be employed.

Devices which fulfill requirements to be met under the first classification include: gear tooth calipers, templets, pin gages, etc. In the second classification would be: testing fixtures employing needle indicator or dial gages, master gears in combination with recording devices, etc.

From the standpoint of inspection, the four most important elements are: tooth shape; tooth spacing; tooth thickness; and concentricity. Helical gears introduce a fifth element: helix angle.

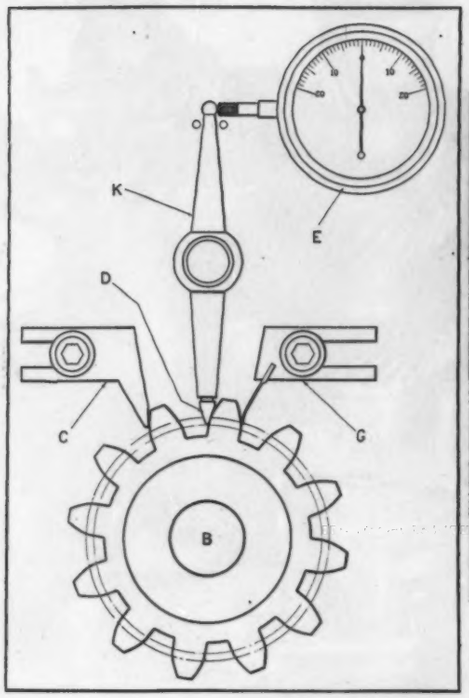
FIG. 3—Gear checking machine employing a master involute cam rather than base cylinders. The testing fixture is controlled by the master involute cam and guide bars.

Checking Tooth Shape

Most gears in use are of involute tooth shape and checking the involute is a comparatively simple operation. The involute is that curve traced by a point in a string as it is unwound from a cylinder known as the base circle. A device employing this fundamental principle is shown in Fig. 1. This is known as an involute testing machine. It operates as follows: two straight edges are attached to a pedestal and are located in the same plane. Two cylinders, of the same diameter as the base cylinder from which the involute is generated, roll on these straight edges. These cylinders are held on an arbor and a head is provided to facilitate rolling in the manner shown in Fig. 2.

In the central plane, and at the point of origin of the involute is located a contact pointer to trace the curve on the gear tooth. This pointer through suitable arrangements operates a dial indicator without multiplication, the multiplication being in the indicator itself. It is obvious that as the base cylinders roll along the straight edges without slippage, any movement of the indicator needle indicates a deviation from the true involute. This is a basic principle and is employed where extreme accuracy is desired in the checking of tooth shapes.

Another method is shown in Fig. 3. While the principle used here is fundamental, it is applied in a slightly different manner. A master involute cam, rather than base cylinders, is employed and the testing fixture is controlled by the master involute cam and guide bars. As the testing fixture is moved about on the table with the involute master in intimate contact with the guide bars, any variation in the involute being checked from that of the master is reflected in a movement of the indicator needle. This



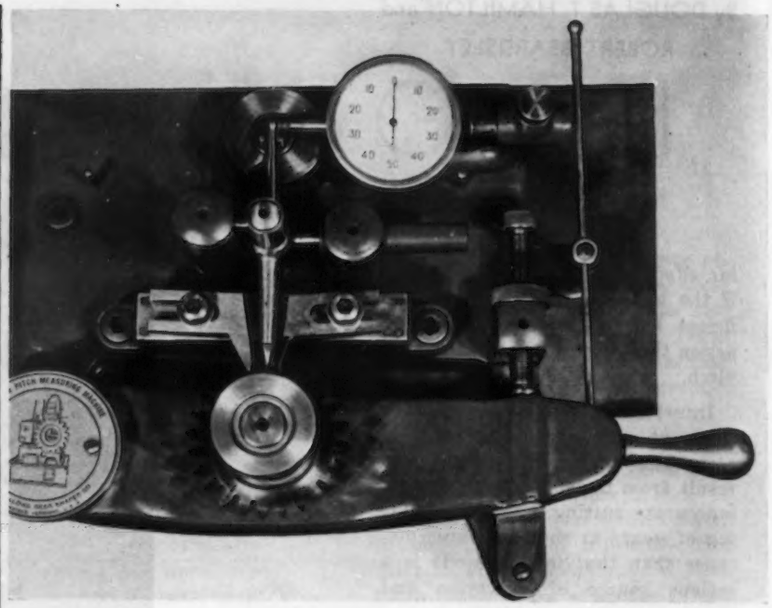


FIG. 4—Fixture for checking tooth spacing, or circular pitch.

FIG. 5—Diagram illustrating the principle of the circular pitch testing fixture.

gear measuring machine is particularly adaptable to checking gears and is easy to operate.

Checking Circular Pitch

Tooth spacing or circular pitch can be checked very readily on a fixture generally termed a circular pitch testing fixture, Fig. 4. This device has a fixed stop against which the gear tooth is brought to bear, and a movable pointer connected with a dial indicator which contacts the adjacent side of the following tooth. The principle is illustrated diagrammatically in Fig. 5. The gear is held on stud *B* carried in a fulcrumed arm. One side of the tooth is brought in contact with fixed stop *C*, being held against this stop by spring block *G*. The contact pointer *D* carried in lever *K* is brought in contact with the adjacent side of the following tooth. Any errors in tooth spacing are registered on the dial indicator. All of the teeth of the gear are checked by withdrawing the fulcrumed arm and indexing the gear on the stud.

This same principle is applied on a gear measuring machine, Fig. 6. The fixture is fulcrumed to the table to which a stop is also clamped. The fixture carries a contact pointer, stop and spring finger that fulfill the same function as similar members on the fixture previously shown.

The circular pitch checking devices previously shown are applicable to external gears only. A fixture for checking circular pitch of internal gears is also available. The same principle for mounting the contact pointer is employed, and the entire apparatus is attached to a swinging arm, which can be elevated to remove and replace the work. The position of this arm can be definitely set to check gears of various diameters, within a cer-

FIG. 6—Gear measuring machine employing same principle as the fixtures shown in Figs. 4 and 5.

tain range, by means of an adjustable stop located at the rear of the bracket.

Tooth Thickness, Backlash and Center Distance

Tooth thickness, backlash, and center distance all bear a direct relation to each other. Where two gears having the same number of teeth are to operate together, backlash is generally provided for by thinning the teeth of both gears an equal amount. Where one gear is much smaller than the other, it is the practice to leave the teeth of the pinion standard thickness and provide for backlash by thinning the teeth on the gear. This would be the recommended practice where both were made from the same material, as it would tend to more nearly balance the strength of the teeth in gear and pinion.

There are two methods of measuring backlash: one by the use of a feeler gage placed between the teeth when they are located at the required center distance; and the other by bringing the teeth into intimate contact and then determining the difference between the standard and measured center distance. This last check does not indicate backlash directly, but it can be determined by the following formula:

$$B = 2 \text{ Tan. } VP \times d$$

In which: B = Backlash in inches
VP = Pressure angle
d = Difference between standard and measured center distance.

Checking Eccentricity

Eccentricity of the pitch circle can be checked by a device known as a cone point testing fixture, Fig. 7. The gear to be checked is held on a fixed stud and is free to rotate on the latter. The stud is retained in a fulcrumed arm. The cone pointer is held in a spring actuated plunger, this plunger contacting the plunger of the dial indicator. The cone pointer is located in the tooth spaces and any errors in concentricity are reflected directly on the indicator.

In checking helical gears, an element not present in spur gears is introduced. The teeth are not parallel with the axis, but are located in an angular relation to it. To obtain the best results from helical gears, that operate on parallel axes, it is imperative that tooth contact between mating gears extend across the face width of the gears, necessitating that the helix angle of mating gears be held within close limits.

In checking this element of helical gear teeth, the sine bar method is generally employed, Fig. 8. Two settings are required: one with the pointer on the fixture located about 1/10 in. from the upper end of the tooth; and the second at a similar distance from the lower end.

The fixture is fulcrumed to the table, the pointer holder adjusted to bring the pointer in the correct relation near the top of the tooth, and the stop on the table set to bring the pointer in the vicinity of the pitch line. A gage block 0.100-in. thick is placed under the indicator plunger and the needle set at zero.

The next step is to set the machine for the second setting, but before doing so it is necessary to determine the arc through which the table should be rotated as well and the height of the work with relation to the pointer. The angu-

(CONTINUED ON PAGE 92)

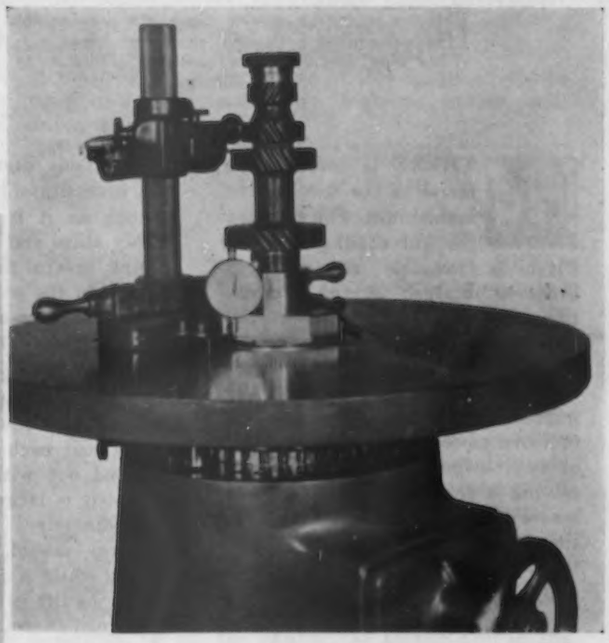


FIG. 8—Machine for checking the lead of helical gears. (At right)

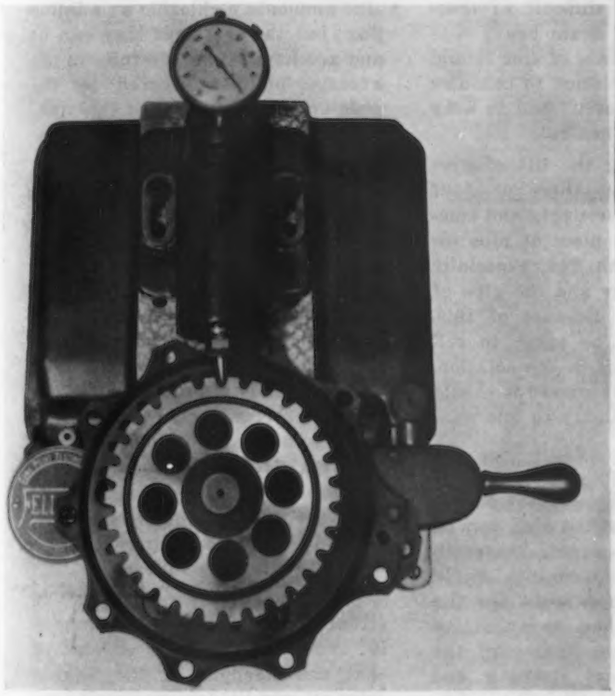


FIG. 7—Cone point testing fixture for checking eccentricity of pitch circle. Errors in concentricity are shown directly on the indicator.

THE tongs on the moving chain are drawing this pipe from the galvanizing bath, and an air jet blows out the interior of the pipe. This view is by courtesy of the A. M. Byers Co., Pittsburgh.

Zinc Ammonium

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By H. G. HOBBS

Steel Service Engineer, Cleveland

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THERE is considerable merit to the use of zinc ammonium chloride in the galvanizing of pipe. First, a tangible reduction in dross is obtained by the elimination of hydrochloric acid in the "bosh" tank. Second, there is with its use as a solution a thorough fluxing of material, whereas it is impossible to conceive of several or more pieces of pipe, ½ in. O.D. or even larger, by 30 ft. long, receiving a thorough fluxing on the inside while being forced *en bloc* through a deep and viscous volatilizing flux.

For an operation of this nature a cold solution is the only practical one, due to the compactness of a large and heavy lift of pipe with the consequent impossibility for each piece of pipe to become thoroughly dried inside and outside by the heat absorbed from any hot rinsing and fluxing solution into which the lift might be immersed. Likewise an immense "hot plate" surface area would be necessary if one could be used to assist in this drying and preheating. The use of a cold solution requires that each lift of pipe be drained thoroughly when removed from the pickling tank and again when taken from the rinse tank, so as to minimize the acid "carry-over" and dilution of the fluxing solution. At the same time speed is essential during these two periods of draining in order to get the lift into the solution before oxidation sets in.

The solution should carry an average strength of 25 deg. to 30 deg. Bé. and will be serviceable until outside dirt and contamination necessitate its dumping. Inasmuch as it is difficult to thoroughly rinse and drain heavy lifts of pipe, several slabs of zinc should be kept in the solution to consume any acid "carry-over" and to keep it substantially neutral.

Merely dipping the lift of pipe into the solution three or four times will not thoroughly and completely coat each piece of pipe inside and out with flux, especially if the lift is large and the pipe of small diameter. Because of this, measures should be taken to roll the lift while it is in the solution, and as the lift is removed it should be drained thoroughly to minimize solution waste.

The volatilizing flux of zinc ammonium chloride carried on the surface of the molten zinc can be mostly foaming agent, inasmuch as the actual flux content would be used more as a body for the foaming agent than as an active flux for additional fluxing of the pipe. The normal strength and depth of this flux, sufficient to minimize the splattering of zinc, are maintained by the wet flux adhering to the pipe and by the additions of solid flux and foaming agent.

Note: The seeming "bugaboo" of a liquid flux, i.e., the combination of the expensive dilution of the fluxing solution by wet material, and its inability to remove the oxide which will form should the draining of the rinsed material be slow and immersion into the solution delayed, is not as great as would be indicated by the repeated references made to it in the various chapters of this article. Both are problems which must be considered when using zinc ammonium chloride as a liquid flux; but the fact that they can be and are handled successfully in the average plant is proved by the wide and extensive use of this fluxing medium and practice in present-day galvanizing.

While zinc ammonium chloride in its solid form is used very often as a flux in the gavanizing of nails, it does not offer any advantage over sal ammoniac. However, made up into a hot (180 deg. to 190 deg. F.) 15 deg. Bé. solution and used as a liquid flux into which the nails are immersed just prior to galvanizing, it becomes the better and more economical fluxing agent of the two, for in solution form it offers several fundamental advantages which cannot be obtained from a solid flux. Briefly, these advantages are as follows:

A liquid flux, regardless of strength, coats each nail thoroughly; thus an economy is effected in that the strength of the fluxing solution can be experimented with until the strength is found which will coat the nails with the minimum amount of flux necessary for good galvanizing.

As each nail is thoroughly coated with a more or less even coating of flux, the galvanizer obtains a m o r e satisfactory galvanizing operation, i.e., s m o o t h e r and brighter finish and less rejects from spots and poor coating.

When using the liquid flux, "sal fumes" are reduced materially with a consequent improvement in the working conditions of the department and a reduction in the

Chloride: Its Place in Modern Galvanizing

amount of finished product discolored by excessive and heavy fuming of the flux.

The overall period of time required for galvanizing is less with a liquid flux than with a solid flux inasmuch as time is required for the breaking down and volatilizing of the latter and for fluxing the nails, whereas with a liquid solution the nails are already coated with a flux which completely volatilizes in the first few moments of the operation.

While a strength of 15 deg. Bé. is given as the proper strength for fluxing nails, local plant conditions and the type of nails galvanized will affect this figure to a certain extent; hence each plant should conduct experiments to ascertain the strength of solution most suitable and economical for its requirements.

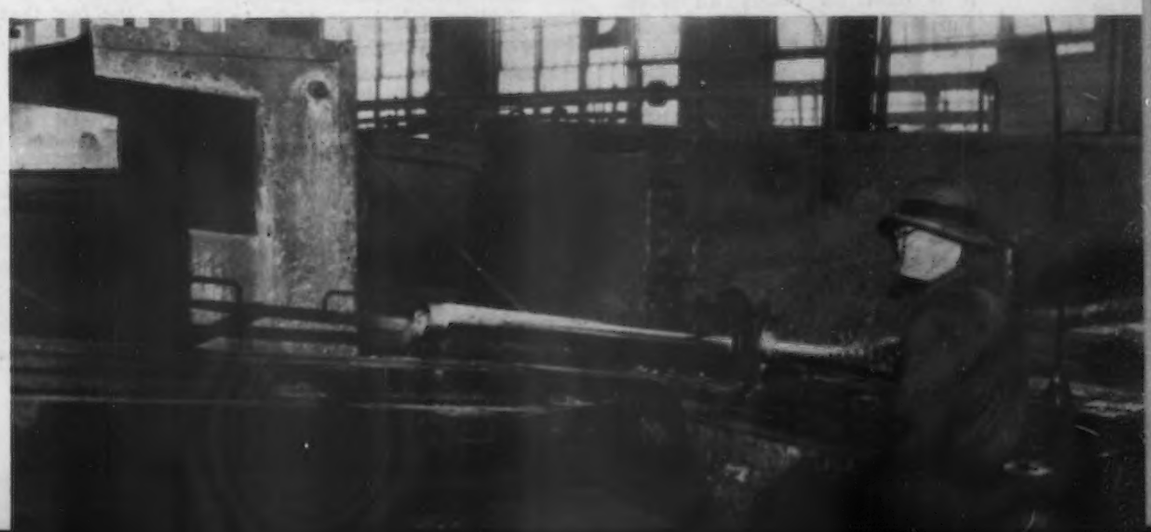
Except in a few isolated cases where local conditions have brought about a measure of success, zinc ammonium chloride used as a liquid flux in the preparation of wire for galvanizing has failed to show sufficient economy in operation and sufficient improvement in the finished product to warrant its adoption in place of "killed zinc" (zinc dissolved in hydrochloric acid) or plain hydrochloric acid. This failure is attributable to several factors. For instance, the pickling and fluxing operations employed in most wire galvanizing plants consist of a pickle in hydrochloric acid with no rinse. The wire goes directly from the pickling solution into a cleaner and weaker solution of the same acid, this being the flux or "bosh" tank solution, and from there into the molten zinc. Both solutions are kept hot, usually by an open-end steam line. In a few cases, mostly where zinc chloride made of "killed zinc" is used as a fluxing solution in the place of hydrochloric acid, a rinse tank is used between the pickling tank and the flux or "bosh" tank, but such installations are in the minority.

IN this article, the concluding installment of a three-article series, the author presents a review of the application of zinc ammonium chloride as a flux in the galvanizing of pipe, nails, wire, buckets, boilers, drums and line hardware. In THE IRON AGE of May 23, the history of galvanizing fluxes was reviewed, and on June 13 the advantages and disadvantages of using zinc ammonium chloride in the galvanizing of castings and of sheets were discussed.

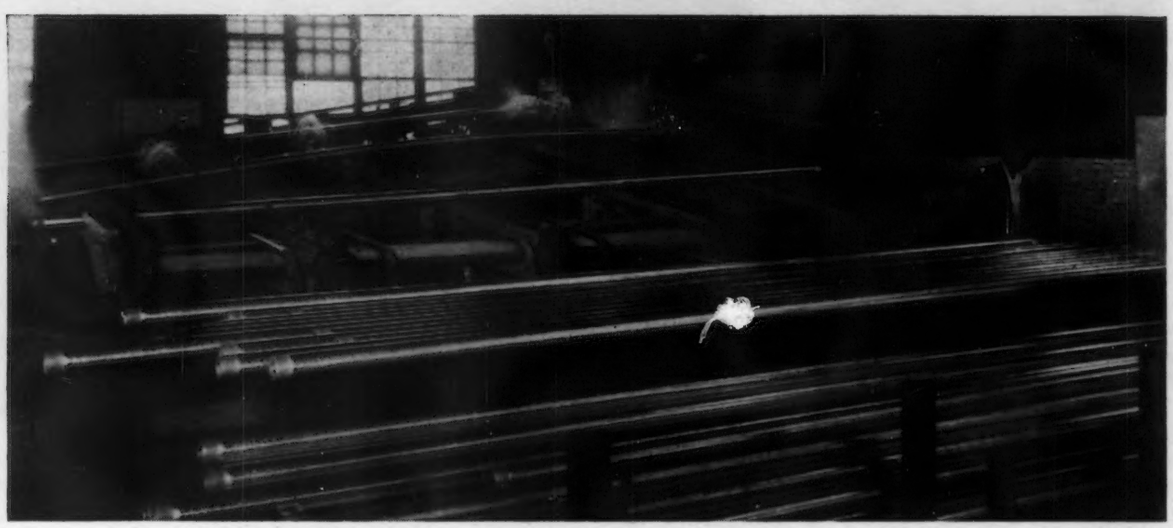
However, with the use of a liquid zinc ammonium chloride solution the rinse tank is absolutely essential. Properly equipped, such a tank should have at the entrance end a strong spray for the purpose of eliminating acid "carry-over" into the fluxing solution. The temperature of the rinse water, regardless of this spray, should be sufficiently high to induce self-drying.

The fluxing solution should be hot (180 deg. to 190 deg. F.) and should average 5 deg. to 6 deg. Bé. in strength. Heating of the solution should be done with a steam coil inasmuch as an open-end steam line would rapidly dilute the solution to the point where its strength would be insufficient to properly flux the wire. A stronger solution than 5 deg. to 6 deg. Bé. is not necessary, and an increase of this strength would merely add to the objectionable tendency of the flux to accumulate and volatilize on the back-end of the pan, to which it has been carried by the fluxed wire in such quantities that in time it is dragged down through the pan by the steady pull of the wire being galvanized. A cold fluxing solution requires the same strength and method of operation as does a hot solution, but, inasmuch as the constant "dragout" of the cold solution is expensive, this practice is not recommended.

Wire galvanizers, except when "double-dip" galvanizing, seldom if ever use sal ammoniac on the back-end of a pan, their one objection



A MORE detailed view of the A. M. Byers installation, showing the tongs attached to the pipe and the air jet removing excess zinc as the pipe emerges from the galvanizing bath.



INSPECTING galvanized pipe at the A. M. Byers Co. plant. After leaving the galvanizing pot, the pipes are cooled by the water sprays shown in the background. In the foreground, inspectors are examining the pipes for defects in coatings.

to this volatilizing flux being its "dragging through" into the pan, where it rises to and "messes up" the surface of the molten zinc. Therefore, their extension of this objection to include the steady accumulation and "dragging through" of the volatilizing zinc ammonium chloride flux can be readily understood.

As a summary, it may be stated that the proper use of zinc ammonium chloride as a liquid flux in place of hydrochloric acid will show a tangible reduction in the amount of dross produced (this reduction ranging from 3 per cent to 6 per cent in the average plant) in the galvanizing of wire. However, the difference in the initial cost and the daily consumption of the two fluxing agents, the cost of the additional equipment required in most cases, the closer supervision necessary with the zinc ammonium chloride solution, and the fact that little or no noticeable improvement is evident in the finished product, minimize the economic advantage of this dross reduction to the point where it is offset in nearly all cases. Furthermore, in some cases the dross reduction advantage is more than offset by the increase in the overall cost of fluxing.

For the sake of brevity the term "buckets" will be used in this chapter to designate all galvanized fabricated articles, such as washtubs, buckets, ash cans, pails, garbage cans, etc., which are usually made in plants manufacturing and galvanizing buckets.

These buckets are fabricated from hot-rolled and annealed sheets, and usually undergo a certain amount of punching, forming, seaming, riveting and welding. Also, for the most part they acquire one or more bands of heavier metal and a bail or handle, and nearly always become more or less smeared with grease and oil. Therefore, a stack or nest of buckets does not present so much a problem of pickling as it does one of cleaning for the removal of this grease.

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Many plants have the necessary equipment to de-grease and rinse the buckets before pickling, but there are a sufficient number without this equipment to warrant elaborating on what the lack of it can mean. Lacking a de-greasing solution, the removal of grease from the buckets must be done in the pickling solution which, because of this grease, has to be carried at a much higher strength and temperature than otherwise would be necessary. Intensive pickling with this strong solution often leads to overpickling and seldom removes all of the grease from the buckets. The grease remaining is carried on through the rinse tank (in those plants equipped with a rinse tank), through the flux or "bosh" tank containing a hydrochloric acid solution, and on into the volatilizing flux on the galvanizing kettle, there to carbonize and materially assist in "killing" the flux.

It is rather difficult to conceive of an economical and successful galvanizing operation in a plant where the total equipment for the complete operation (de-greasing, rinsing, pickling, rinsing, liquid fluxing and galvanizing of buckets spotted with grease and oil) consists of a pickling tank, a rinse tank to which hydrochloric acid has been added so that it will flux as well as rinse, and a galvanizing kettle. However, this is the equipment set-up which will be found today in more than one plant fabricating and galvanizing buckets.

The practice of removing a nest of several or more buckets from the pickling solution, rinsing and fluxing this nest as a unit, and still as a unit setting them within reach of the pot man who breaks it up by immersing the buckets, one at a time, into the galvanizing kettle, presents difficulties to the proper rinsing, liquid fluxing and draining of the buckets. Allowing for the fact that the nest is loosened each time it is immersed into the rinse water or fluxing solution, the speed of operation in most plants is such that between the time the nest is removed from the pickling solution and the time it reaches the pot man, there can be little or no time allowed for proper rinsing of the pickling solution and thorough draining of the rinse water and of the hydrochloric acid "bosh" tank solution. The result is that the latter solu-

THIS plant hand dips the pails in flux, after which they are galvanized. Zinc ammonium chloride can be used quite advantageously in the galvanizing of pails and pressed-steel containers.

tion is steadily diluted with rinse water, and most of the buckets enter the volatilizing flux coated with a heavy film of acid.

An increased cost of pickling due to premature dumping of greasy solutions, an increased cost in maintaining a volatilizing flux because of premature decomposition from fluxing greasy buckets, and a greater economic loss incurred through the increase of dross produced by heavy and constant additions of acid to the volatilizing flux, can all be attributed to grease, and poor rinsing and draining. In addition, when consideration is given to the seams, ridges, indentations, the overlapping of metal in a bucket, all of which present pockets or traps for acid film, and particularly for dead flux, there is every reason to believe that the complaint heard in many plants of the excessively high percentage of flux spots on the galvanized bucket, necessitating regalvanizing, and of the highly corrosive attack of these flux spots if overlooked in the final inspection, also can be justly attributed to a consistently dirty and highly acid volatilizing flux which has been made and kept that way by the steady fluxing of a grease-spotted product carrying an excessive film of acid.

While zinc ammonium chloride is used in plants where the equipment and practice necessitate the galvanizing operation containing some or all of those factors which have been described and which materially and detrimentally affect the flux and the whole operation, sufficient has been written already

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regarding the importance and necessity of proper de-greasing before pickling, and thorough rinsing and draining of all solutions employed before galvanizing; therefore, in describing the proper use of zinc ammonium chloride as a flux in this operation, it will be with the assumption that the buckets reach the fluxing solution free of grease, properly pickled, and thoroughly rinsed and drained. It must not be taken for granted that complete and thorough rinsing and draining of the solutions into which the buckets are immersed during the course of the entire operation will mean the elimination of nesting and the handling of several or more buckets as a unit. Some plants have tried and adopted a practice of pickling, rinsing and fluxing the buckets loosely nested together, and removing them from the various solutions as a nested unit, but upon removal temporarily breaking up this unit by removing and draining each bucket separately, then renesting for passing on to the next operation. This method materially reduces the objectionable "carry over" of the various solutions, and it does not increase the time of the operation to the point where it retards production.

The fluxing solution used in this operation should average 20 deg. Bé. in strength and should be used cold in conjunction with a volatilizing flux on the surface of the molten zinc, this flux to be of sufficient depth to minimize the splattering of zinc, which is the primary purpose for its use. The usual precautions should be taken to prevent acid "carry over" into the fluxing solution; and to consume any which might be carried over by the rinsed material, one or more slabs of zinc should be kept in the solution. Due to the amount of solution which can be entrapped in the average bucket or similar product, it is far more economical to drain the fluxed buckets over the fluxing solution than to stack them on the feeding table, where they drain until dry or the pot man disposes of them.

While it is possible in this operation to use a hot fluxing solution in conjunction with a "hot plate" and no volatilizing flux on the surface of the molten zinc, it is scarcely feasible. The size of some of the products galvanized requires a preheating oven rather than a "hot plate," and the smaller products, necessarily unnested before placing in the oven, would almost always be out of the reach of the pot man.

Note: A zinc ammonium chloride volatilizing flux is made up in the same manner as one made from sal ammoniac, and the foaming agents which have been successfully used with the latter flux will react equally well with zinc ammonium chloride.

With the exception of that portion of the chapter devoted to the handling of small articles and to

(CONTINUED ON PAGE 92)

A.S.T.M. Committees Report

ASSEMBLED in their thirty-eighth annual meeting, about 1000 members of the American Society for Testing Materials were entertained by varied and highly informative technical sessions during the week of June 24 at Detroit. About 48 technical papers and 45 reports from the various committees were presented during the meeting's fifteen sessions. An extensive exhibit of testing apparatus and related equipment also was a feature which afforded members a unique opportunity to examine many types of standard equipment and also a variety of special instruments used by the testing fraternity.

The report of committee E-4 on metallography was of particular interest to laboratory workers inasmuch as it included the recommendations of subcommittee 1. These recommendations included an extensive revision of the standard methods of metallographic testing of iron, steel and non-ferrous metals and alloys. They are as follows:

Cleanliness during polishing and etching is essential. All grease and oil must first be removed. For galvanized material, the zinc should be removed by dissolving in cold, concentrated HNO_3 or in dilute H_2SO_4, unless, of course, the galvanized coating itself is to be studied. The nitric acid method requires some care to prevent overheating as large samples generate much heat. The container should be immersed in a cooling medium during use. Rusted fractures may be cleaned with a dilute solution of ammonium citrate or phosphoric acid.

Iron and steel specimens should be prepared in the following manner:

(*a*) Rough grinding on an abrasive wheel or coarse emery paper is usually sufficient, and even machined surfaces may sometimes prove satisfactory for deep etching specimens for macroscopic examination. A somewhat smoother finish may be desirable when less severe etching, such as with ammonium persulfate, is to follow, or in sulfur printing.

(*b*) In polishing for microscopic examination, the specimen should not be too large, preferably not over ½ to 1 in. square and about ½ in. in thickness. A flat surface is obtained either by rubbing the specimen on a file held in a vise or by grinding on an abrasive wheel. The specimen is then ground on emery paper, which may be mounted on disks revolving at about 500 to 1200 r.p.m.; three successive grades of paper, such as Nos. ½, 0, 00, are sufficient. The grinding on each paper should be in one direction, preferably at 90 deg. to that in the preceding stage. This is followed by the wet polishing stages on cloth-covered wheels revolving at about 400 r.p.m. To these are applied water suspensions of No. 320 alundum, No. 600 alundum, and levigated alumina, respectively. The cloth should not be too thick and should have no

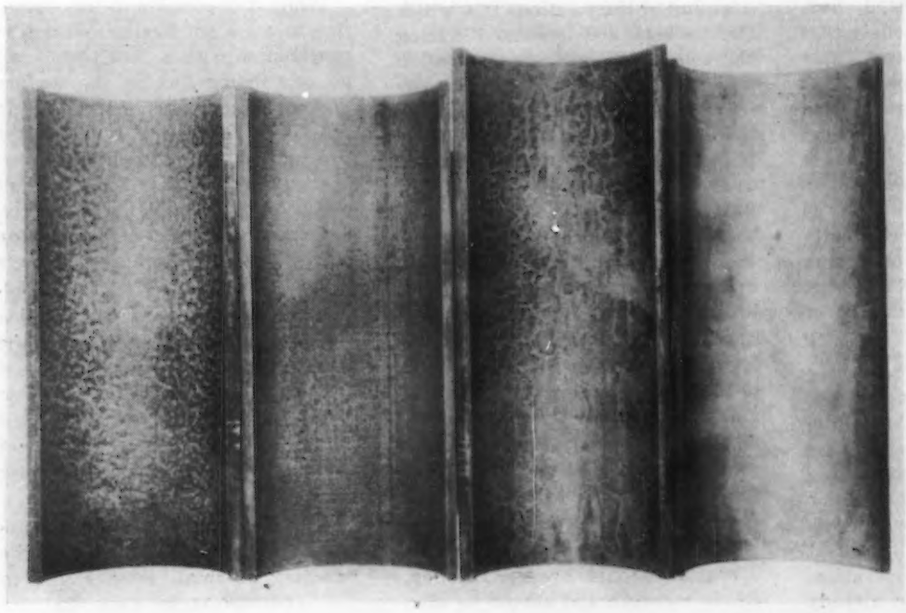

FIG. 1—Appearance of inner surface of steel pipe specimens after corrosion tests. Reading from left to right: Material K used successively for five runs totaling 14 weeks; material K machined before run in softened water; material F after one run in tap water; and material F machined before run in softened water.

Corrosion and Metallographic Data

"nap;" a cotton cloth resembling ordinary linen table cloth in weave and weight works well. The final polishing to remove all scratches is on a velveteen cloth with Merck's heavy magnesia; this should be applied dry by rubbing into the moistened cloth; any rough particles can be felt with the fingers and wiped off to the edge of the disk by hand.

During these wet polishing stages the specimen should be intermittently or continuously turned about the vertical axis to avoid pitting. The specimens should be washed after each stage to avoid carrying over any of the abrasives to the next stage and must not be allowed to stand without drying, as deep pits, due to rusting, may form very rapidly. After polishing, the specimen should be washed in warm water (21 deg. C. maximum) or alcohol, swabbed with absorbent cotton moistened in alcohol, and dried in a blast of warmed air (21 deg. C. maximum). Special care should be taken to wash the magnesia wheel in water containing a trace of HCl after using, as the magnesia cakes and hardens by taking up CO_2 from the air.

Other Polishing Methods

(*c*) Very satisfactory results can be obtained with the procedure described in paragraph (*b*), but many other satisfactory variations have been suggested. Vilella omits the intermediate wet polishing stages and goes directly from fine emery paper (No. 000), smoothed by rubbing with graphite, to the final polishing wheel. This reduces the chances of dragging out nonmetallic inclusions in steels and graphite in gray and malleable cast iron. A good flat crepe with alumina for the abrasive is said to be a satisfactory substitute for velveteen and magnesia for studying inclusions. It is essential that pitting and dragging out of inclusions and of graphite be avoided; this can be accomplished by the general method outlined in paragraph (*b*), if care is used. Other investigators also recommend final dry polishing for material containing graphite. Wheels covered with paraffin are used by a number of laboratories, generally with the abrasives suspended in a solution of 50 per cent liquid soap and 50 per cent water. Impregnating the abrasives in the paraffin wheel has been tried. Pulsifer omits the final polishing stages and etches after wet polishing on emery flour; alternately etching and polishing.

(*d*) A recommended method for polishing cast iron consists in running through on the four grades of abrasive papers (from Nos. 180 to 400) on vertically mounted wheels rotating at about 500 to 600 r.p.m. The center portion of the No. 400 disk, where the paper has been glazed with graphite, is used for the fifth polishing step. The final polish is made on moistened flat silk crepe which is mounted on a horizontal-type disk rotating at 750 r.p.m. Levigated alumina (which settles at the rate of ¼ in. per hr.) is used as the abrasive.

Table II—Corrosion Data on Non-Ferrous Alloys in Sulfuric Acid (Pickling Solutions)

Material	Series D Test Location No. 31, 42 days exposure		Series C Test Location No. 32, 59 days exposure		Series C Test Location No. 33, 92 days exposure	
	Change in Weight, gm.	Corrosion Rate, mg. per sq. dm. per day	Change in Weight, gm.	Corrosion Rate, mg. per sq. dm. per day	Change in Weight, gm.	Corrosion Rate, mg. per sq. dm. per day
A—Commercial Copper	19.9	451	17.8	286	31.0	320
C—Cu-Si-Mn Alloy (96 Cu, 3 Si, 1 Mn)	18.0	408	15.6	251	26.3	272
D—Tin Bronze (92 Cu, 8 Sn)	23.0	521	17.6	284	32.0	330
H—Aluminum Bronze	15.6	354	14.9[a]	248	23.1	238
J—Low-Carbon Ni-Cr-Fe-Alloy (22 Ni, 20 Cr, bal. Fe)	0.2	5	3.2	52	2.4	24
K—Manganese Bronze	17.9	406	[b]	...	[c]	...
L—Brass (85 Cu, 15 Zn)	19.2	435	18.5	298	28.3	292
M—Brass (70 Cu, 30 Zn)	19.2	435	[b]	...	[c]	...
N—Admiralty Metal (70 Cu, 29 Zn, 1 Sn)	18.2	413	[b]	...	28.5	294
P—Cu-Ni-Zn Alloy (75 Cu, 20 Ni, 5 Zn)	18.8	427	18.6	299	28.0	289
Q—Cu-Ni-Sn Alloy (70 Cu, 29 Ni, 1 Sn)	18.3	415	18.1	291	26.6	274
R—Cupro-Nickel (83 Cu, 17 Ni)	19.3	437	19.2	308	29.4	303
S—Nickel-Copper Alloy (70 Ni, 30 Cu)	14.5	329	20.3	326	25.2	260
T—Commercial Nickel (99 + per cent)	14.4	327	27.4	441	[c]	...
X—Silicon Cast Iron	3.5	46	8.4	79	0.4	2
Y—Leaded Bronze (75 Cu, 10 Sn, 15 Pb)	25.6	337	33.9	320	43.6	263

[a] Two specimens lost due to brittleness.
[b] All specimens lost due to brittleness.
[c] All specimens lost.

This method permits the retention of graphite with a good, scratch-free surface. In general, very soft specimens are more difficult to polish than hard ones. Specimens about ¼ or ⅜ in. square are preferred to larger sizes, due to the shorter time required for any given step in the polishing procedure, particularly on the silk crepe wheel. The less time spent in the last stages of polishing, the better are the chances for complete retention of graphite. Sulfur has been found to be a satisfactory mounting material.

(*e*) Polishing machines in which the specimen is held and rotated automatically have been employed and are being more and more extensively used.

(*f*) Various abrasives have been used. Rodda has described a method for preparing graded abrasives for metallographic polishing but for most work, however, the commercially obtainable abrasives and polishing powders are satisfactory. Ordinary levigated alumina purchased in bulk may be re-levigated just before using by suspending in water for about a minute or longer and siphoning. Silicon carbide and boron carbide powders and diamond dust have been recommended by Hoyt for polishing tungsten carbide.

In general, polished metal shows no trace of crystalline structure; *etching is used to clearly delineate the structure and to produce optical contrast between the various constituents.* A great number of etching reagents and methods for iron and steel have been proposed, but the majority of work can be done with relatively few reagents.

In deep etching, hot solutions of HCl or H_2SO_4, or mixtures of these acids, are generally used; deep etching reveals physical and chemical non-homogeneity such as porosity, cracks, seams and segregation; an aqueous solution of ammonium persulfate brings out the grain structure; Stead's reagent brings out phosphorous banding; Fry's reagent brings out strain lines. Cooling low-carbon steel specimens in either ordinary or "dry" ice prior to etching is said to improve grain boundary contrast. For photographing, increased contrast is obtained by washing after etching and applying glycerin to the etched surface.

In Table I are given the etching

Table I—Recommended A.S.T.M. Etching Reagents for Iron and and Its

Iron and Steel
(For Microscopic Examination)

Etching Reagent	Composition		Remarks	Uses
No. 1. Nitric acid (2 per cent Nital)	HNO_3 conc.) Ethyl alcohol (abs.)	2 ml. 98 ml.	Only clear white HNO_3 (sp. gr. 1.42) should be used; time, a few seconds to about a minute.	For carbon steel, iron, and cast iron. Nital brings out grain boundaries clearly, carbides are unetched for the structures of nitrided steels.
No. 1A. Nitric acid (1 per cent Nital)	HNO_3 (conc.) Ethyl alcohol	1 ml. 99 ml.	See reagent No. 1.	For tempered samples.
No. 2. Picric acid (5 per cent Picral)	Picric acid Ethyl alcohol (abs.)	5 g. 100 ml.	Clean, dry, picric acid crystals should be used; time, a few seconds to about a minute or more.	Same as reagent 1A; the grain size of quenched steels is brought out after prolonged etching; picral shows detail more delicately than nital.
No. 3. Sodium picrate	Picric acid Sodium hydroxide H_2O	2 g. 25 g. 100 ml.	Use boiling, 5 to 10 min.	Colors cementite, but not carbides high in chromium; in tungsten steels, iron-tungstide (Fe_3W) and iron-tungsten-carbide (Fe_3W_3C) are colored, but tungsten carbide is unaffected; attacks sulfides.
No. 4. Ferricyanide solution	Potassium ferricyanide Potassium hydroxide H_2O	10 g. 10 g. 100 ml.	May be used cold, but preferably hot; should be freshly made; time, 5 to 10 min.	Darkens carbide containing chromium; carbides and tungstides in tungsten and high-speed steels. At room temperature colors ternary carbides (Fe_3W_3C or Fe_4W_2C) in a few seconds, iron tungstide (Fe_3W_3) in several minutes, and barely colors cementite.
No. 5. Hydrogen peroxide and sodium hydroxide	H_2O_2 10 per cent NaOH, aqueous solution	10 ml. 20 ml.	Use fresh; etch 10 to 12 min.	Darkens iron tungstide in carbon-free iron-tungsten alloys. When carbon is present this solution darkens the compound (FeW + WC?) in proportion to the amount of carbon present tungsten carbide is darkened.
No. 6. Stead's reagent	Cupric chloride Magnesium chloride HCl (conc.) H_2O Ethyl alcohol	1 g. 1 g. 1 ml. 20 ml. 100 ml.	Dissolve the salts in the least possible quantity of hot water; etch for about a minute; should be used with discrimination.	For showing segregation of phosphorus; copper tends to deposit first on areas poorer in phosphorus.
No. 7. Fry's micro-reagent	HCl (conc.) H_2O Cupric chloride Ethyl alcohol	40 ml. 30 ml. 5 g. 25 ml.	Time, about 10 sec.	To reveal strain lines and precipitation effects in "aged" steel. Requires careful examination.
No. 8. Mixed acids in glycerol	Glycerin HNO_3 (conc.) HCl (conc.) Acetic acid (28 per cent)	3 parts 1 part 2 parts 1 part	Time, about 30 sec. or longer; method of alternate polishing and etching should be used.	For 18 per cent chromium, 8 per cent nickel stainless steel; also for structure of iron-chromium base alloys containing aluminum, tungsten, vanadium, manganese, nickel and molybdenum.
No. 9. Chrome-regia	HCl (conc.) Chromic acid (10 per cent)	25 parts 5 to 50 parts	The activity of this solution is controlled by the amount of chromic acid.	For 18 per cent chromium, 8 per cent nickel stainless steel.
No. 10. Ferric chloride	Ferric chloride HCl (conc.) H_2O	5 g. 50 ml. 100 ml.	Time, about a minute.	For austenitic nickel-steels.
No. 11. Marble's reagent	Copper sulfate HCl (conc.) H_2O	4 g. 20 ml. 20 ml.	May also be used hot; time about a minute.	For structure of stainless steel, particularly to reveal extent of carbide precipitation in 18 per cent chromium, 8 per cent nickel steel; total depth of nitrided case.
No. 12. Copper sulfate and cupric chloride	H_2O $CuSO_4$ $CuCl_2$ $MgCl$ HCl (conc.) Dilute to 1000 ml. with 95 per cent ethyl alcohol.	100 ml. 1.25 g. 2.5 g. 10 g. 2 ml.	Chemicals should be accurately weighed. Time, about 30 sec. or less to a minute.	For showing total depth, structure, and various zones of nitrided steels.
No. 13. Ferricyanide solution	Potassium ferricyanide Potassium hydroxide H_2O	1 to 4 g. 10 g. 10 ml.	Use a freshly made boiling solution for 15 min.	Shows difference between carbides and nitrides; cementite is blackened, pearlite is turned brown, and massive nitrides remain unchanged.
No. 14. Neutral sodium picrate	1 per cent neutral sodium picrate solution.		Wash salt well with alcohol to remove excess picric acid or alkali, immerse in boiling solution for 20 min.	Darkens iron tungstide in high speed steel but not the complex carbide; darkens iron-phosphide in cast iron but not cementite.
No. 15. Chromic acid and heat tinting	8 per cent chromic acid, followed by heat tinting.		Etch first in picric acid, then for 1 min. in chromic acid; heat tint by placing specimen face up on a hot plate heated to about 250 C. (500 F.) for about a minute.	Distinguishes between iron-phosphide and cementite in the phosphide eutectic of cast iron; iron-phosphide is colored darker.

Steel, Aluminum and Its Alloys, Copper and Its Alloys, and Nickel Alloys

Etching Reagent	Composition		Remarks	Uses
No. 18. Hydrofluoric acid	HF HNO_3 Glycerol	2 parts 1 part 2 to 4 parts	Time, about 1 min.	For structure of high silicon alloys of the duriron type.
No. 17. Iodine solution	0.1 *N* iodine solution Alcohol	1 part 10 parts	Time, 5 to 15 min.	For detecting silicon dissolved in iron; higher silicon areas more lightly etched.
No. 18. Electrolytic etching	Copper ammonium chloride H_2O Current density 0.5 amp. per sq. dm.	0.5 g. 100 ml.	Time, 30 min., repeated etching and polishing.	To develop etching pits in iron.
No. 19. Mixed acids	HCl HNO_3	3 parts 1 part	Saturate with cupric chloride and let stand 20 to 30 min. before use. Swab.	For stainless alloys and others high in nickel or cobalt.
No. 20. Nitric and acetic acid	HNO_3 Acetic acid	6 parts 4 parts	Swab.	Same as for reagent No. 19.
No. 21. Nitric acid in nitrobenzol.	HNO_3 (conc.) Methyl alcohol Add 40 drops of above solution to 50 ml. nitrobenzol.	20 ml. 80 ml.	Immerse specimen about 5 to 15 sec., rinse in alcohol, swab with concentrated NaOH to remove film, rinse in alcohol. Use only anhydrous acid and alcohol in reagent.	For detecting cementite, particularly in silicon steels. Used instead of reagent No. 3.

Nickel and Its Alloys

Etching Reagent	Composition		Remarks	Use
No. 1. Flat solution	HNO_3 (conc.) Glacial acetic acid	50 ml. 50 ml.	Make up fresh daily; use clear white HNO_3 to avoid staining; etch by immersion at room temperature for 5 to 20 sec.	Nickel, Monel metal and other nickel-copper alloys. Dilute with 25 to 50 per cent acetone for alloys of less than 25 per cent nickel.
No. 2. Electrolytic contrast	Glacial acetic acid H_2O HNO_3	5 ml. 85 ml. 10 ml.	Electrolytic etch for 2 to 60 sec. using 1.5 v. dry cell and platinum wires.	Very satisfactory for grain-size studies. Stains less than flat solutions.
No. 3. Nitric acid	HNO_3 (conc.) H_2O	30 ml. 70 ml.	Etch by immersion.	Macroetch for nickel silver.
No. 4. Potassium cyanide	KCN H_2O H_2O_2	5 g. 95 ml. few drops	Etch by immersion.	For low-zinc nickel silver.
No. 5. Ammonium hydroxide-hydrogen peroxide	NH_4OH H_2O_2	85 ml. 15 ml.	Etch by immersion.	For high-zinc nickel silver.

Iron and Steel
(For Macroscopic Examination)

Etching Reagent	Composition		Remarks	Use
No. 1. Hydrochloric acid	HCl (conc.) H_2O	50 ml. 50 ml.	Used hot or boiling for about 10 to 15 min. depending on the steel.	Showing segregation, porosity, cracks, depth of hardened zone in tool steel, soft spots, etc.
No. 2. Mixed acid	HCl (conc.) H_2SO_4 (conc.) H_2O	38 ml. 12 ml. 50 ml.	Recommended by Yatsevitch, to be used as above for from 15 to 45 min.	Same as for reagent No. 1; works well for stainless steel.
No. 3. Nitric acid	HNO_3 (conc.) H_2O	25 ml. 75 ml.	Used cold for large surfaces such as split ingots which cannot conveniently be heated.	Same as for reagents Nos. 1 and 2.
No. 4. Ammonium persulfate	$(NH_4)_2S_2O_8$ H_2O	10 g. 90 ml.	Surface should be rubbed with absorbent cotton during etching.	To bring out grain structure in cases of excessive grain growth, recrystallization at welds, etc.
No. 5. Stead's reagent	Cupric chloride Magnesium chloride HCl (conc.) Alcohol	2.5 g. 10.0 g. 5 ml. Up to 250 ml.	The salts are dissolved in the HCl with the addition of the least possible quantity of hot water.	To bring out phosphorus-rich areas and phosphorus banding.
No. 6. Fry's reagent	Cupric chloride HCl (conc.) H_2O	90 g. 120 ml. 100 ml.	Most useful for mild steel, particularly bessemer steel; before etching, sample should be heated to 200 to 250 C. (302 to 482 F.) for 5 to 30 min., depending on the condition of the steel; during etching the surface should be rubbed with a cloth soaked in the etching solution; wash in alcohol or rinse in HCl (1:1) after etching to prevent deposition of copper.	To show up strain lines due to cold work.
No. 6A. Fry's reagent	Cupric chloride HCl (conc.) H_2O	45 g. 180 ml. 100 ml.	Same as for reagent No. 6 but modified by Wasau; may give more contrast; specimen can be washed in water without depositing copper.	Same as for reagent No. 6.
No. 7. Nital	HNO_3 Ethyl alcohol	5 ml. 95 ml.	Etch 5 min., followed by 1 sec. in HCl (10 per cent).	To determine cleanness and to increase contrast.

reagents commonly recommended for macroscopic examination of iron and steel.

Application of Sulfur Printing

Sulfur printing is a macroscopic method for revealing sulfur segregation and the size and distribution of the sulfides.

The surface of the specimen is pressed against a sheet of photographic paper which has been moistened with a dilute aqueous solution of sulfuric acid (2 to 10 per cent). Matte-finish photographic paper is preferable to prevent slipping. A few seconds to about a minute contact may be necessary depending on the sulfur content. Yellow or brown specks on the paper indicate the presence of sulfides in the specimen. The prints are fixed in sodium thiosulfate ("hypo"), washed, and dried. Transparent silver bromide paper can also be used to give a sulfur print transparency from which contact prints in any number can be made on ordinary photographic paper.

There is some question whether the presence of phosphorus will also give a yellow color. Royen and Ammermann state that prints made on gelatin paper with use of the following solutions reveal only sulfur; phosphorus having no effect:

Solution No. 1

25 gm. of cadmium acetate plus 200 ml. of acetic acid (80 per cent) to which is added a solution of 500 ml. of H_2SO_4 in 950 ml. of H_2O.

Solution No. 2

120 gm. of $CuSO_4$ plus 880 ml. of H_2O plus 120 ml. of H_2SO_4.

The specimen to be tested is pressed for 2 to 4 min. upon gelatin paper which has been treated with solution No. 1, and yellow cadmium acetate is precipitated. By immersion for 2 to 3 min. in solution No. 2, this is transformed to the dark brown to black Cu_2S.

Etching for Microscopic Examinations

Mild etching solutions are generally used for microscopic examination. For carbon steels, solutions of picric or nitric acid in ethyl alcohol are most commonly employed; alkaline solutions like sodium picrate or potassium ferricyanide are used for darkening the carbides; for stainless steel aqua regia diluted in glycerin gives good results while electrolytic etching is frequently employed.

The polished and thoroughly cleaned sample is immersed in the solution face up by means of nickel or other corrosion-resisting etching tongs. During etching it is often desirable to stir the solution gently or to swab the surface with absorbent cotton to avoid deposition of smudge; for stainless steel this is necessary to also prevent gas bubbles from clinging to the surface. The progress of etching can generally be observed visually, but it should also be carefully timed. If the sample is not etched sufficiently, the process may be repeated, but if it is overetched the sample may have to be repolished or even reground; too deep etching, therefore, should be avoided. It may frequently be necessary, especially with stainless steel, to etch, repolish, and reetch, in order to remove the surface layer of deformed metal produced during grinding and polishing.

In Table I are given the etching reagents commonly recommended for microscopic examination of iron and steel.

Cracks are readily revealed by deep etching (a 15 per cent solution of sulfuric acid in water works well for grinding cracks), but this method may be too destructive for some purposes and may actually cause cracks. For fine cracks such as may be produced by quenching, fatigue, or in grinding hardened steel, the "magnaflux" magnetic method is useful. Another method is to place the part to be tested in warm oil, clean thoroughly, and paint with lime; the presence of cracks is revealed by oil spots in the lime. In still another method the sample is immersed in a sulfide solution; due to the capillary effect some of the solution is sucked into any crevices present. The sample is then cleaned and pressed against photographic paper moistened in dilute sulfuric acid; black silver sulfide is formed at the cracks.

Preparation of Aluminum and Its Alloys

For preparing aluminum and its alloys for microscopic examination, the following procedures are recommended:

A plane surface is obtained and saw-marks removed by rubbing on a medium mill file. After the file cut, the specimen is rubbed successively on Nos. 0, 00, and 000 metallographic emery papers coated with

Copper and Its Alloys

Etching Reagent	Composition		Remarks	Use
No. 1. Ammonium hydroxide-hydrogen peroxide	NH_4OH (sp. gr. 0.88) H_2O H_2O_2 (3 per cent)	5 parts 5 parts 2 to 5 parts	Peroxide content varies directly with copper content of alloy to be etched. Immersion or swabbing for about 1 min. Fresh H_2O_2 is desirable for good results.	Generally used for copper and many of its alloys. Film on etched aluminum bronze removed by weak Grard's solution.
No. 2. Ammonium hydroxide	Dilute solutions.		Immersion.	Polish-attack etching of brass and bronze.
No. 3. Ammonium hydroxide-ammonium persulfate	NH_4OH H_2O $(NH_4)_2S_2O_8$ (2.5 per cent solution)	1 part 1 part 2 parts	Immersion.	Polish-attack of copper and some alloys.
No. 4. Ammonium persulfate	$(NH_4)_2S_2O_8$ H_2O	10 g. 90 ml.	Use either cold or boiling. Immersion.	Copper, brass, bronze, nickel silver, aluminum bronze.
No. 5. Chromic acid	Saturated aqueous solution (CrO_3).		Immersion or swabbing.	Copper, brass, bronze, nickel silver (plain etch).
No. 6. Chromic acid-hydrochloric acid	CrO_3 (10 to 15 per cent) HCl	50 ml. 1 to 2 drops.	Add HCl at time of use. Imersion.	Same as reagent No. 5. Color by electrolytic etching or $FeCl_3$ reagents.
No. 7. Chromic acid-nitric acid	HNO_3 (conc.) H_2CrO_4 H_2O or HNO_3 H_2CrO_4 H_2O	50 ml. 20 g. 30 ml. 5 ml. 20 g. 75 ml.	Immersion.	Aluminum bronze; film from polishing removed by 10 per cent HF.
No. 8. Copper ammonium chloride-ammonium hydroxide	10 per cent aqueous solution of copper ammonium chloride plus NH_4OH to neutral or alkalinity.		Immersion. Wash specimen thoroughly.	Best for darkening large areas of beta in alpha-beta brass. Copper, brass, nickel silver.
No. 9. Ferric chloride	Parts: $FeCl_3$ / HCl / H_2O 1 / — / — 5 / 50 / 100 19 / 6 / 100 5 / 10 / 100 25 / 25 / 100 1 / 20 / 100 8 / 25 / 100 10 / 1 / 100 3 / 10 / 100		Immersion or swabbing. Etch lightly or by successive light etches to required results. Grard's No. 1. Grard's No. 2. Plus 1 part CrO_3. Plus 1 part $CuCl_2$ and 0.05 part $SnCl_2$.	Copper, brass, bronze, aluminum bronze; darkens beta in brass; gives contrast following bichromate and other etches.
No. 10. Nitric acid	Various concentrations.		Immersion or swabbing.	Deep etching.

Table III—Summary of Changes in Tensile Properties of Non-

Negligable.....less than 1 per cent.....left blank Small.....1 to 3 per cent.....marked s

Material		Pittsburgh (Industrial)				Altoona (Industrial)				New York City (Industrial)				Rochester (Industrial)			
		Tensile Strength		Elongation		Tensile Strength		Elongation		Tensile Strength		Elongation		Tensile Strength		Elongation	
		1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.
Copper and copper alloys	A	....	s	....	s	....	s	....	....	....	s	....	....	....	....	....	....
	B	s	s	s	....	s	X	s	....	s	X	....	....	....	....	....	....
	C	....	s	....	....	....	s	....	....	....	s	....	....	....	....	....	....
	D	....	s	....	....	....	....	....	....	....	....	....	....	....	....	....	....
	F	....	s	....	....	....	s	....	....	....	s	....	....	....	....	....	....
	K	....	X	....	....	s	X	....	....	....	X	....	....	....	....	....	....
	L	....	s	....	....	....	s	....	....	....	s	....	....	....	....	....	....
	M	s	X	....	....	....	X	....	s	X	X	....	X	....	....	....	....
	N	....	s	....	....	....	s	....	....	....	s	....	....	....	....	....	....
	P	s	....	....	....	....	X	....	....	....	s	....	....	....	....	....	....
	Q	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Aluminum and aluminum alloys	G	....	....	X	X	....	....	s	X	....	....	X	X	....	....	s	X
	I	s	X	X	....	s	X	X	....	....	X	X	X	....	....	....	....
	O	s	X	X	X	s	X	X	X	X	X	X	X	....	s	X	X
	Z	s	X	X	X	....	X	X	X	s	X	X	X	....	....	X	X
	FF	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Nickel and nickel alloy	S	....	....	....	....	....	....	....	....	....	....	....	s	....	....	....	....
	T	....	s	....	....	....	X	....	....	....	s	....	....	....	....	....	....
Lead, lead-antimony alloy and tin	U	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
	CC	....	....	....	....	....	s	....	s	....	....	s	....	....	....	....	....
	EE	....	....	....	....	....	X	....	....	....	....	....	....	....	....	....	....
Zinc	AA	X	X	....	X	s	X	....	....	s	X	X	....	....	....	s	X
	BB	s	s	....	s	s	s	s	X	s	X	....	X	....	....	....	X
	HH	....	X	....	....	X	X	s	X	s	X	....	X	....	....	....	X

DESCRIPTION OF MATERIALS

A = Commercial copper (tough pitch)
B = Commercial copper (phosphorized)
C = 96 per cent copper, 3 silicon, 1 manganese
D = Tin bronze
F = Aluminum bronze (92 Cu, 8 Al)
K = Manganese bronze
L = Brass (85 Cu, 15 Zn)
M = Brass (70-30)
N = Admiralty metal
P = 75 Cu, 20 Ni, 5 Zn
Q = Cu-Ni-Sn alloy
G = Commercial aluminum

Etching Reagent	Composition		Remarks	Use
No. 11. Potassium bichromate	$K_2Cr_2O_7$	2 g.	NaCl can be replaced by 1 drop HCl to 25 ml. solution added just before using. Immersion.	Copper, copper alloys of beryllium, manganese, silicon, nickel silver and bronze. Followed by $FeCl_3$ or other contrast etch.
	H_2SO_4 (sp. gr. 1.84)	8 ml.		
	NaCl (saturated solution)	4 ml.		
	H_2O	100 ml.		
No. 12. Electrolytic etch	$FeSO_4$	30 g.	Use 0.1 amp. at 8 to 10 v. Generally not over 15 sec. Do not swab surface after etching.	Darkens beta in brass, gives contrast after H_2O_2 etch. Nickel silver, bronze and other alloys.
	NaOH	4 g.		
	H_2SO_4	100 ml.		
	H_2O	1900 ml.		

Aluminum and Its Alloys

Etching Reagent[a]	Composition		Remarks	Use
No. 1. Hydrofluoric acid	HF (conc.)	5 ml.	Swab with soft cotton for 15 sec.	General; microscopic.
	H_2O	95 ml.		
No. 2. Sodium hydroxide	NaOH	1 g.	Swab for 10 sec.	General; microscopic.
	H_2O	99 ml.		
	or			
	NaOH	10 g.	Immerse for 5 sec. at 70 C. (160 F.); rinse in cold water.	Can be used for both micro and macroetching.
	H_2O	90 ml.		
No. 3. Sulfuric acid	H_2SO_4 (conc.)	20 ml.	Immerse for 30 sec. at 70 C. (160 F.); quench in cold water.	Aluminum-copper-iron-manganese from aluminum-iron-manganese or aluminum-copper-iron.
	H_2O	80 ml.		
No. 3A. Sulfuric acid	H_2SO_4 (conc.)	10 ml.	Immerse at 60 to 70 C.	$FeAl_3$.
	H_2O	90 ml.		
No. 4. Nitric acid	HNO_3 (conc.)	25 ml.	Immerse for 40 sec. at 70 C. (160 F.); quench in cold water.	[a]Aluminum-iron-silicon from $FeAl_3$; microscopic.
	H_2O	75 ml.		
No. 5. Keller's etch	HF (conc.)	1.0 ml.	Immerse for 10 to 20 sec.; wash in stream of warm water.	Microstructure of duralumin type alloys.
	HCl (conc.)	1.5 ml.		
	HNO_3 (conc.)	2.5 ml.		
	H_2O	95.0 ml.		
No. 6. Flick's etch	HF (conc.)	10 ml.	Immerse for 10 to 20 sec.; wash in warm water followed by dip in concentrated HNO_3.	Microscopic etching.
	HCl (conc.)	15 ml.		
	H_2O	90 ml.		
No. 7. Tucker's etch	HF (conc.)	15 ml.	Etch by immersion.	Macroscopic.
	HCl (conc.)	45 ml.		
	HNO_3 (conc.)	15 ml.		
	H_2O	25 ml.		
No. 8. Vilella's etch	HF (conc.)	2 parts		General.
	HNO_3 (conc.)	1 part		
	Glycerine	3 parts		

Ferrous Alloys After 1 Yr. and 3 Yr. Exposure

Significant.....3 per cent and over.....marked X

Sandy Hook (Sea Coast)				Key West (Sea Coast)				La Jolla (Sea Coast)				State College (Rural)				Phoenix (Rural)			
Tensile Strength		Elongation		Tensile Strength		Elongation		Tensile Strength		Elongation		Tensile Strength		Elongation		Tensile Strength		Elongation	
1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.	1 yr.	3 yr.
									S										
S	S							S	S					S				S	
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		S																S	
						S				S									
	S	S		S		S	S		S		S						X	S	
	S		X						S	X	X								
	S							X	X	X	X		S						
			S					X	X	S	X								
							S	S	X	X	X			S					

DESCRIPTION OF MATERIALS

I = Al-Mn alloy (1 per cent Mn)
O = Duralumin (4 Cu, 0.5 Mn, 0.5 Mg)
Z = 98 Al, 0.5 Mg, 1 Si
FF = Aluminum coated duralumin
S = 70 Ni, 30 Cu
T = Commercial nickel
U = Chemical lead
CC = Lead antimony alloy (1 Sb)
EE = Commercial Tin
AA = Prime Western zinc
BB = High-grade zinc
HH = Commercial zinc (99.99 + Zn)

a solution of paraffin in kerosine to keep the specimen bright and prevent embedding particles of the abrasive in the surface.

If a suitable microtome is available, a more satisfactory surface can be obtained by using it to replace the two operations just described.

The first wet polishing operation is carried out on a broadcloth-covered wheel rotating at about 300 r.p.m. A water suspension of No. 600 alundum flour (or a similar material) is generally used as the abrasive. This mixture is conveniently prepared by placing a quantity of the abrasive in a flask of water and shaking until it is in suspension. It can then be supplied to the wheel directly from the flask while the specimen is held in contact with the broadcloth. The alundum tends to settle, so the flask should be shaken frequently during the early stages of polishing. As polishing progresses, however, the coarser abrasive should be washed from the wheel with a stream of water from a wash bottle and a suspension used, from which the coarser particles have been settled out.

The final wet polishing operation is carried out on a wheel covered with "kitten's ear" broadcloth and rotating at about 150 to 200 r.p.m. The cloth (Note 1) is thoroughly moistened with distilled water (*not* tap water) and Merck's heavy magnesium oxide powder (Note 2) worked into it with the fingers or palm of the hand, brushing away any coarse particles. The cloth should be kept moist with distilled water at all times during polishing and, near the end of the operation, should be washed nearly free of abrasive; finishing the polishing with the wheel rotating slowly and using a plentiful supply of water. This final polishing must be done very carefully, varying the pressure and time of polishing with the alloy and temper of the specimen. The polishing on this second wheel should remove all striations from the alundum cut and the specimen should frequently be turned through 180 deg. to avoid surface flow.

Note 1

New polishing cloths should be boiled in distilled water for several hours prior to use in order to soften the fibers. When not in use, the cloth should be kept in distilled water slightly acidified with hydrochloric acid.

Note 2

Several grades of magnesium oxide are

prepared specifically for metallographic use and have been found satisfactory for polishing other metals. When used for aluminum, however, the caustics they contain result in undesirable etching.

When polishing is complete, the specimen should be washed in a stream of warm water and dried by blowing the excess water from the surface. The polished surface must not be touched or rubbed on anything thereafter. Specimens will retain their finish indefinitely if kept in a desiccator or sterilizer cabinet where dust, dirt and moist gases from the atmosphere will not collect on the surface.

Specimens to be examined macroscopically need not be polished as carefully as those for microscopic examination. If large enough, they may be suitably prepared by machining the surface on a shaper or lathe using a recommended practice for machining aluminum. Small specimens may be prepared by rubbing on several grades of abrasive paper beginning with about No. 180 aloxite and ending with No. 0 emery.

In Table I are given the etching reagents commonly recommended for aluminum and its alloys. Two methods of etching are referred to in Table I; swabbing and immersion. Swabbing gives generally uniform and satisfactory results and is especially desirable for preparing surfaces for photography or identification of constituents. For macroscopic examination, however, etching by immersion is preferred unless the specimen is too large. When the immersion method is used, the specimen should not be held in the tongs during etching as they are of a different alloy and may affect the etching rate.

It is very important to control the temperature of the specimen and the reagent, the time of etching and the concentration of the reagent in order to secure the best results.

Preparation of Copper and Its Alloys

In the preparation of copper and copper alloy specimens for microscopic examination, a plane surface is secured by filing or with an emery wheel copiously supplied with water. The specimen is then polished, generally in three stages, on wheels rotating at 1000 to 1800 r.p.m.

The first wheel is covered with 8 to 12-oz. canvas duck and uses FF Turkish emery, No. 500 carborundum, or powdered alundum as an abrasive. The second wheel is covered with wool broadcloth and uses tripoli as the abrasive (two felt-covered wheels may be used instead; the first with "RF" and the second with "SF 6X" flour emery as abrasives). The final wheel has a covering of either fine grade wool or "kitten's ear" broadcloth and employs a water suspension of levigated alumina or finely powdered magnesium oxide as an abrasive (chamois has been used as a covering for this wheel and jeweler's rouge as an abrasive).

All polishing wheels are kept wet during use by a water drip and the specimens, between steps, are kept wet and thoroughly rinsed free of abrasives. After removal from the final wheel, the specimen may be immediately etched or rinsed in alcohol and quickly dried prior to etching. In much of the routine preparation of specimens, the final etching is depended upon to remove many shallow scratches. When rouge is being used on the final wheel, it is possible to remove the specimen at a critical moment when the polished face becomes clean and dry, and etch directly.

Pure copper is more difficult to polish than its alloys, since a nearly perfect surface is required in order to detect the presence of cuprous oxide in the unetched specimen.

For macroscopic examination, the specimen may be prepared by grinding and rough polishing or by finishing with a fine tool on a shaper.

In Table I are given the etching reagents commonly recommended for copper and its alloys.

Combinations of etches are frequently employed in the examination of copper alloys in order to secure contrast between several consituents. For instance, when alpha and beta structures are both present, a ferric chloride etch following the ammonium hydroxide-hydrogen peroxide etch will darken the beta constituent. Similarly, a beautiful coloration of copper and phosphor-bronze can be obtained by following an ammonium hydroxide-hydrogen peroxide etch with a few seconds of electrolytic etching. In etching the copper-beryllium alloys, the specimen is frequently given a slight initial etch in potassium bichromate, followed by 10 to 15 sec. in the electrolytic solution.

Preparation of Nickel and Its Alloys

Nickel and nickel alloy specimens are first ground on a series of abrasive papers of increasing fineness, such as French Nos. 0, 00, and 000 or carborundum Nos. 240, 320 and 400, mounted on wheels revolving at 400 to 600 r.p.m. A final grinding on a paper made by graphiting a sheet of the French No. 000 or carborundum No. 400 paper is frequently inserted prior to wet polishing and, if done, eliminates the one wet polishing operation. When this fine paper is omitted, wet polishing is begun with a water suspension of No. 600 alundum on a broadcloth-covered wheel rotating at 500 to 800 r.p.m. This is followed by a few seconds' polishing with a water suspension of levigated alumina (settled at ¼ in. per hr.) on a wheel covered with broadcloth or flat silk crepe. The procedure employing the graphited paper and a crepe covering on the final wheel is useful in retaining inclusions and largely avoids pitting and surface flow.

In Table I are given the etching reagents commonly recommended for nickel and its alloys.

Etched specimens should be thoroughly washed with water and alcohol and dried in an air blast. Stains can be removed by wiping with a clean, smooth cloth or cotton.

This A.S.T.M. paper on recommended practices for metallographic testing also included etching reagents and preparation procedures for lead and its alloys, zinc and its alloys, magnesium and its alloys, and precious metals.

Corrosion of Steel Pipe

One of the several investigations on corrosion reported at the meeting concerned itself with continuous-flow corrosion studies of steel pipe. The laboratory work on this subject was performed by E. J. Ash and F. Sillers, Jr., of the National Research Council. The formal paper was prepared by H. S. Rawdon and L. J. Waldron of the National Bureau of Standards.

The shortcomings of ordinary laboratory corrosion tests are well recognized, particularly for use as a basis for predicting what may be expected to occur in service. Such

(CONTINUED ON PAGE 39)

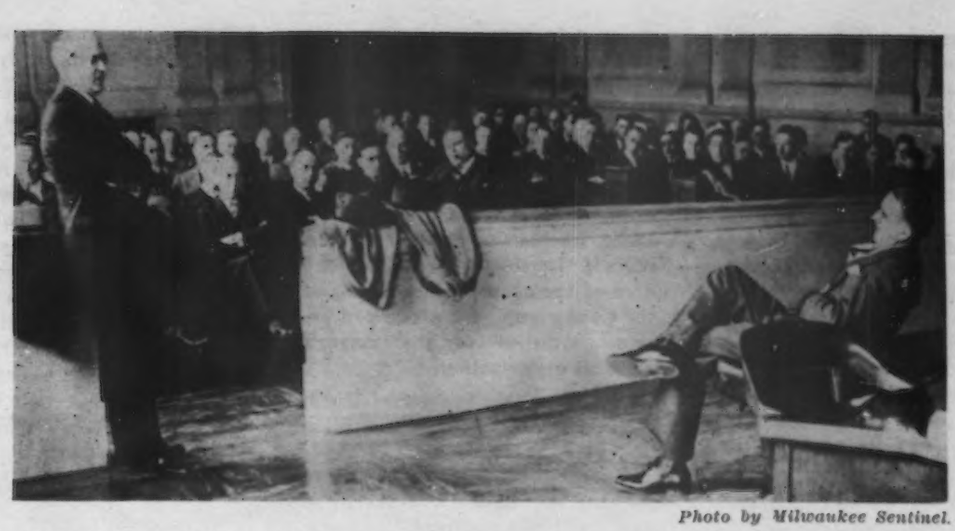


Photo by Milwaukee Sentinel.

"THIS city is sending its policemen out with batons stuffed with cotton while a strike leader carries a gun," declared a member of the citizens' committee (standing) to the mayor (seated inside the rail).

How Secure Are Your Constitutional Rights?

Case Company Strike Indicates What Can Happen to Industry and Workers When Public Officials Fail to Enforce the Law

By ROGERS A. FISKE

o o o

A pinch of labor dissatisfaction, a dash of radicalism and a full measure of disregard for the law by local public officials . . . when these are well mixed, and flavored with the smell of politics, there is brewed a concoction that throws one-sixth of an industrial city's working population out of employment for 11 weeks and for a loss of over $750,000 in wages.

Possibly eyebrows will be arched at the figures as being commonplace in any so-called labor strife, but the combination that led up to and that prevailed during the recent strike at the J. I. Case Co.'s plant at Racine, Wis., must be set apart as something different and above all un-American.

THOSE who minimize the importance of constitutional rights will get a much needed education if they read Mr. Fiske's chronicle of events during the J. I. Case Co. strike at Racine, Wis. Rights are taken for granted when they are not threatened. But our forefathers had to fight for those rights, and laxity in guarding them may force us to fight to win them back, if the breakdown of law enforcement that occurred in the Wisconsin city is a criterion of what can be expected in other industrial centers.

When public streets are barred to citizens, when through highways are blockaded to normal and peaceful traffic, when a court injunction is ignored by public officials as well as by strikers, when peace officers neglect to protect those who wish to work, then there is breakdown of government and the main issue is no longer that of labor versus industry.

First, a few words concerning the Case company, which is the third largest unit in the farm implement industry. It was started in 1842 and since that date it has

had a clear labor record except for a strike in 1934, which the management attributes to depression strain. Only one wage cut was instituted during the depression and that averaged 10 per cent. That cut was restored in full in 1934, the understanding between men and company being that the arrangement was temporary (for four months) and would not become permanent unless warranted by business. Business did not come to the rescue, but the company carried on the advance by absorbing the loss.

When the code went into effect no changes were necessary either as to wages or as to hours except that the working periods of a few watchmen were changed to conform to code regulations. Case has had a pension plan since 1915 and it operated an unemployment insurance plan before the Wisconsin law was passed. A full-time doctor, nurses, a benefit association and a commissary have been available. When the 1935 strike was called, the level of wages was above the average of the industry, being at the 1929 level.

Strike Instigated by Radical Group

It is significant that the American Federation of Labor played no active part in the Case troubles, which in March of this year were brought about by the Wisconsin Industrial Union, a county organization, which had come by several steps from the Unemployed Council. Students of the council stress that similar groups were started all over the country and that demands made by them were identical in all major respects with those made by red and Communistic groups in England and other parts of the world.

The next step was the organization of the Racine County Workers, which attempted a horizontal organization that would blanket all industrial workers and farmers as well. A local in the city hall embraced various classes of city employees. This group was started by the left wingers of the Socialist Party, which elected Racine's mayor for his third term within a few weeks after the 1935 strike started.

Case workers did not like the name of the organization; they felt it did not imply that it was their own. Accordingly the membership at Case, about 800 at the time of the termination of the 1934 strike, accepted the new designation of Wisconsin Industrial Union, Local No. 1, with its implication of State-wide activity. This name was generally used in Racine, but the old name, Racine County Workers, remained in vogue in the country area of the county. The leader of the Case group soon afterward became attached to the mayor's political organization.

The Wisconsin Industrial Union had written into its constitution that dues would be 50c. per member per month, without regard to the rate at which the worker was paid. The organizers evidently had visions of solidifying all Racine County workers into a labor-political machine that would at the start contribute about $10,000 a month to the leaders, who probably could not be held to account for the sums collected. The history of most similar moves is that once adequate power is gained dues are advanced. Workers were sent into areas outside of Racine County and therefore the implication of a State-wide machine is clear.

Minority of Employees Favored Strike

In December, 1934, about three months before the strike was called, a meeting of 78 members of Local No. 1 met and of that number 68 voted for new demands. This group is generally considered to be the radical leadership. On Jan. 10 a full meeting was held and the vote was 3 or 3½ to 1 not to present demands. Sixty days later a committee presented demands after the membership had voted yes or no on the following question:

"Do you empower the arbitration committee to present the demands passed on at the special meeting of Mar. 7, 1935, and either obtain arbitration and settlement, or call a strike within 48 hr.?"

The Racine *Journal-Times*, Mar. 14, 1935, reports that the total vote was 1486, of which 881 were in favor of the demands and the strike alternative and 594 were opposed. Eleven ballots were thrown out. The union claimed Case membership of 1843 out of a total of 2172 employees. If the 881 are matched against either the total employment or claimed membership it is clear that in neither case was a clear-cut majority obtained.

On Mar. 13 a committee met with company officials in the morning. The meeting was still in session when the noon whistle blew and the strike, a passive one the first day, was on. The next day pickets barred not only entrance to the buildings and grounds, but streets and highways as well. The Racine primary was just then getting under way and the election was to come three weeks later.

An Official Promise That Was Not Fulfilled

The *Journal-Times* of Dec. 14, 1934, published over the names of the mayor and chief of police a statement, part of which follows:

"The constituted authorities of this city will not tolerate any violation of the law by way of riot, civil commotion, or seditious meetings or gatherings of any organization or group whatever for the purpose of breaking the law or inciting violence, commotion or damage to life or property.

"Any such attempts will be promptly stopped and the offenders arrested and prosecuted."

Picket lines soon tightened to bar all employees of all classes from all buildings with the exception of the comparatively small executive office. The mayor did nothing either to open public streets blockaded by strikers or in other ways to show equality under the law. Case employees who wanted to work sent communications to city and county law enforcement agencies, but the picket lines remained tight. A meeting of the "return to work" group was intimidated by the presence of many uninvited guests, as reported by the Milwaukee *Sentinel*, April 6, 1935.

State Law Flagrantly Violated

On the 24th day of the strike, Racine newspapers made reference to the State picketing laws and reported a conference between public officials and the union at which it was mutually agreed and the union promised "no physical interference with any employees who want to enter the plant." Statutes permit persuasion but not violent language or intimidation. The fact that this conference was necessary shows the law had not been enforced up to that date. The next

day the picket force was greatly enlarged. Some foremen and members of the printing, engineering and the advertising departments passed the lines, but production men dared not make the attempt.

On April 17 the lines had been further tightened, the agreement had been thrown overboard, employees who had been passing the lines were barred, and newspapers reported the sheriff as admitting that he was powerless. The mayor was also quoted as being at a loss to understand the change in the situation. Then came the city election and the mayor started his third term. In his inaugural address he promised, "Law and order will be maintained in the city of Racine, and both industry and labor will be given the full protection that each is entitled to under the law. There will be no discrimination or partiality shown." A change in public sentiment was indicated when an opponent of the policies of the mayor was selected president of the new City Council.

WHEN anyone approached a factory door the pickets rushed in and blocked the way. Police methods were lacking in effectiveness.

Injunction Granted to Protesting Employees

About this time a group of valiant employees, not identified with any union, started court action to prevent interference with their efforts to resume employment. The strikers caused one court delay after another and finally filed an affidavit of prejudice against Circuit Judge E. B. Belden, who withdrew, and Judge Davidson was called into the hearing. On the 61st day of the strike, newspapers reported unsuccessful efforts of police and deputy sheriffs to penetrate union picket lines.

On May 14, the 62nd day of the strike, Judge Davidson issued an injunction. The court found:

"That the picketing was in all instances in large numbers and in close formation so that access to the place of employment was denied to the plaintiff class who desired to go to work.

"The right to work includes as a necessary incident thereto the right to go to and come from work unmolested. Such a right is entitled to protection by the courts.

"This is not a labor dispute as defined by Section 268.20 and the subdivisions thereunder, but a proceeding upon the rights of the plaintiffs for the protection and preservation of their inherent right to work and to go to the factory for that purpose.

"And I find that unlawful acts upon the part of the defendants have been threatened and committed and will be executed and continued unless restrained.

"And, I further find that the public officials whose duty it is to protect the plaintiffs and all others similarly situated in their inherent right to work and to maintain law and order have utterly failed and neglected to do their duty in the premises."

This is a clear-cut indictment of a minority group of radicals, aided and abetted by public officials, in depriving American citizens of the right to work and support for their families. In fact, under the circumstances, the union and public officials virtually dared American citizens to assume their constitutional rights.

Court Order Flouted by City Authorities and by Union

This injunction was in all its essentials flagrantly violated by the union pickets, and ignored by the city authorities. In fact, violence continued to prevail in open defiance of the Circuit Court injunction. The Milwaukee *Sentinel* of May 17, 1935, in reporting conditions, said that "the police were careful not to use their clubs." About May 30 Judge Davidson, whose picketing injunction had been defied by strikers, appealed to

TWO public thoroughfares were entirely blocked by this method of picketing

the Lieutenant-Governor of Wisconsin for a Senatorial investigation of law enforcement in Racine.

In the meantime, about 56 arrests had been made of violators of the injunction, but the cases were continued from time to time. The law was moving slowly. On June 1, after 80 days of practically unmolested violation of the law, the union voted to return to work. The effort to drive all workers into the union had failed. On June 4 the injunction was made permanent and contempt proceedings against 53 striking employees were dismissed by the court, notwithstanding that the employees who sought the injunction wanted to prosecute these violators.

Many words of commendation are due those employees who threw caution to the winds and, displaying that pioneer spirit by which this country has been built, openly sought by means of court action their right to work as free-born American citizens. It meant more than the simple procedure of banding together and making formal application to a court of justice. It meant that each one of these employees stood single-handed in defense of his home and family, possibly of his own life, in the face of a grasping combination that intended to win by threat and force. Each one made this step knowing that law and order had broken down completely.

Company's Proposals Accepted When Secret Ballot Is Taken

During the 80 days of the strike numerous efforts were made to effect a settlement. The company made neither physical resistance nor any effort to block these moves. It stood firmly on the ground that it had been unfairly treated in that the strike was called when a conference was in session, that a majority of the men out of work did not support the union, and that the law was not being enforced by local authorities. About the middle of March Dr. Stewart Scrimshaw, chairman of the Milwaukee regional labor board, and Harry E. Scheck, department of labor conciliator, appeared on the scene, but their efforts were futile and they soon left Racine. Shortly afterward Mr. Scheck returned but accomplished nothing.

About April 30 the union appealed to Miss Frances Perkins, Secretary of Labor, and several days later Finley F. Bell, Department of Labor mediator, arrived in Racine. There was also present about this time R. G. Knudson, former member of the State Industrial Commission, who was sent to Racine by Governor LaFollette, to whom an appeal had been made by business interests. Mr. Knudson's withdrawal was demanded by the strikers and Mr. Bell left for Chicago. A. J. Altmeyer, Assistant Secretary of Labor, appeared on the scene about May 21. He finally succeeded in arranging conferences and the strike was terminated June 1. Many strikers and many of those who had been opposed to the strike could then be removed from relief rolls and once again enjoy the rights of their American citizenship to work as free men.

The company's proposals, rejected by a standing vote, were accepted by "a substantial majority" when balloting was secret. Actual figures on the ballot are not available, but it is reported that the substantial majority was 4 to 1.

Business Men Condemn Municipal Administration

How had the public been reacting to conditions? The Racine Association of Commerce early urged that "there should be no trampling on the rights or privileges of any one in any organization, either by a heedless minority or a powerful majority. The day has not come in America when power, threats, coercion or selfish interests should be allowed to keep a man from his job or wreck a community." Also, "if a majority, or a minority, of Case employees want to go in the plant and work at their jobs without molestation, the simple duty of all authorities demands that such a right be fully protected."

During the third week in April about 100 business and professional men, members of the clergy and others called on the mayor. The chief of police refused to attend the meeting. A committee of the delegation had called on him and he had made the statement, as reported in the Racine *Journal-Times*, that he had been told by the mayor not to do anything except on his personal order.

Citizens charged that the leader of the strikers had a permit to carry a revolver, and newspaper reports show that the mayor admitted having appointed this union leader a special officer or watchman for duty at the headquarters

of the workers. The question was raised as to what promise the mayor had made to the workers which prohibited the police from doing their duty. The group demanded that the law be enforced and the mayor promised that order would be preserved, and that he would keep "hands off" the chief of police, who would then be free to exercise his own judgment. Little came of these assurances beyond withdrawal of picket lines from public thoroughfares and admission to the plant of foremen, engineers and some others not engaged in productive work.

Boycotts Attempted Against Business Men

Boycotts were attempted against business men who were on the citizens' committee. Level-headed union workers under these men sprang to the defense of their employers. An editorial in the Racine *Journal-Times* said, "Organized labor must insist on wise leadership rejecting Communistic membership and doctrines whenever detected."

Printed advertisements authorized by citizens charged that "The mayor, through cooperation of law enforcement officers, stands idly by and permits the destruction of fundamental constitutional rights of men to work. . . ." Also, "Can it be said that this city . . . has tolerated a political philosophy based on prejudice and hate and the envy of one man for the success of another?"

Case workers who wanted to go back to work published, among other statements, the following: "Again and again the chief of police has been asked for help to stop the illegal picketing seen in the picture above. He has neither sufficient help nor suitable police department facilities, or he is prevented from using them through lack of authority from the chief law-enforcing officer, the mayor."

Industry Is Being Driven from the State

What about "vanishing industry" in Wisconsin? Assemblyman August Labbs of Appleton has offered figures which show that in 1899 there were 7841 manufacturing firms in Wisconsin, 7430 in 1930 and only 5000 in 1934. In Racine alone there were 17 strikes between Feb. 13, 1934, and April 24, 1935. These affected 5484 persons out of 12,500 employables. There were strikes on 296 days out of 14 months and over 218,600 man-days of work were lost, which cost workers $1,500,000 in wages.

It certainly is fair to ask questions such as: "Is this situation basically Communistic?" or "Do low-grade and despicable political maneuvers breed such conditions?" It cannot be said that Racine people are different and that nothing better can be expected of them. In fact, that city and its people have every earmark of having been progressive, and therefore any change now manifested in the temperament of labor can readily be attributed to some subversive un-American influence. Is it Communistic? Is it political? Or, is it a combination of both?

Inaction of Public Officials Stood Out

One fact stands out preeminently and that is the inaction of public officials, who permitted Racine to be indicted before the nation as a "hot-bed" of labor upheaval, when in fact the turn of events rested only on the shoulders of a small minority.

The loss as a direct result of the strike was bad enough in itself. The citizens' committee rightfully foresaw not only the possibility of withdrawal of established industry from Racine, if conditions such as the above were permitted to continue, but it saw other serious threats to the well being of the city. Some industries rent space and they are practically foot-free to move on short notice, and some of them took the step under advisement. Negotiations that were under way to bring new industries to Racine were seriously affected by events. Is there a more certain way in which to check the growth of a community, or to make it dwindle in size and wealth?

Impartial enforcement of the law is a prime prerequisite toward which America has been marching and should continue to march. Is your community prepared to meet the test? Will the law be enforced?

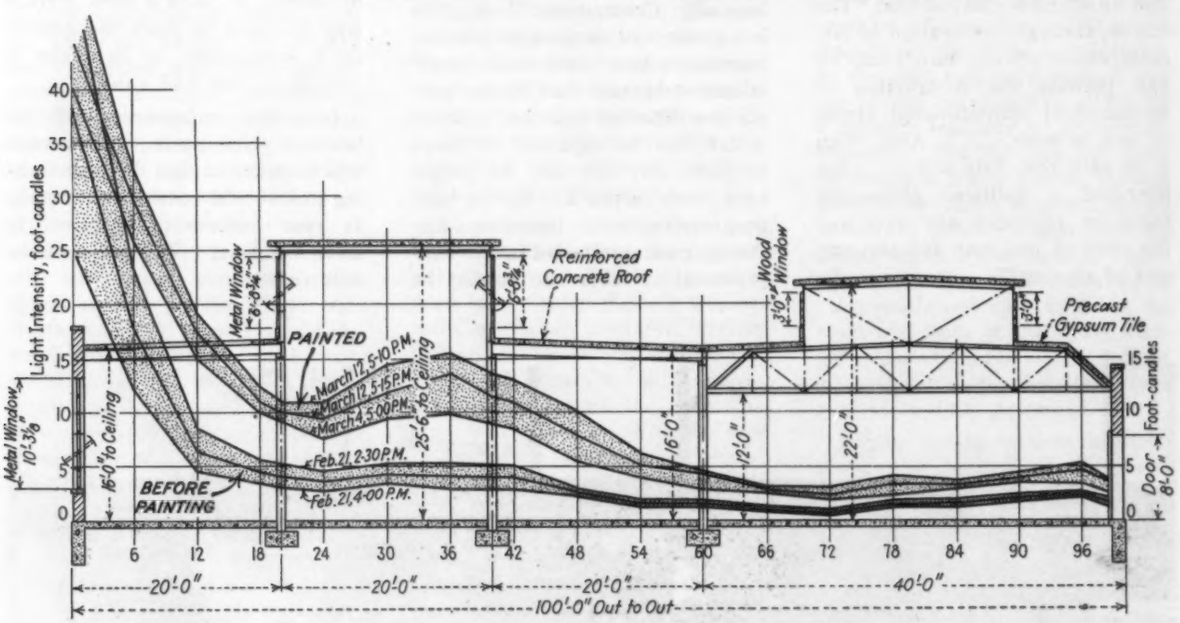
A MAIN highway leading into Racine blocked by pickets. Note highway sign at left.

Increased Light Values Obtained

CONSIDERABLE attention has been focused on the problem of factory illumination in recent years—especially since a mass of evidence has been accumulated by the National Safety Council, the Better Vision Institute, insurance and lighting companies and industry itself which proves that there are definite advantages to industries maintaining high standards of illumination. From various estimates the cost to industry from accidents and spoilage alone, involving poor seeing conditions as a contributing cause, is placed at over $300,000,000 a year.

Granting that adequate illumination affords increased operating efficiency, a better worker attitude, less eye strain and nervous fatigue, better workmanship and fewer rejections, the problem becomes one of obtaining the economic and human benefits accruing from good seeing conditions without a corresponding increase in overhead which would appreciably offset the gains made. Paint is the most important adjunct of both day and artificial light, and the most convincing proof of what paint can do to increase the level of illumination is what it has already accomplished.

At the American Stove Co. in Lorain, Ohio, a variety of structural types and ceiling constructions has been used. It was decided to make a study of the levels of illumination throughout this plant to determine exactly what the lighting values were and what might be done to improve them with a view to improving working



MEASUREMENTS of light intensity were taken at 6-ft. intervals across the width of the building before and after painting, and the foot-candle readings were plotted to scale. The resulting light curves show the improvement in illumination.

Note that the working light at 5 p.m. March 4 after painting is 100 per cent better than at 4 p.m. Feb. 21 before painting. At 5:10 p.m. on March 12 the working light was 15 foot-candles in the monitor bay (at the left) when painted, as compared with 5 foot-candles prior to painting.

This was a one-coat paint job over a very dirty surface. A second coat would have made even greater improvement.

In the 40-ft. bay at the right, painting more than doubled the working light. There are no windows along this side of the building and the monitor sash is less than normal height. Nevertheless painting brought the light up to 4 foot-candles at 5 p.m. compared with 1½ foot-candles at 4 p.m. before painting. This was enough to make this area usable without electric light.

Readings were taken on days of comparable light intensity out of doors.

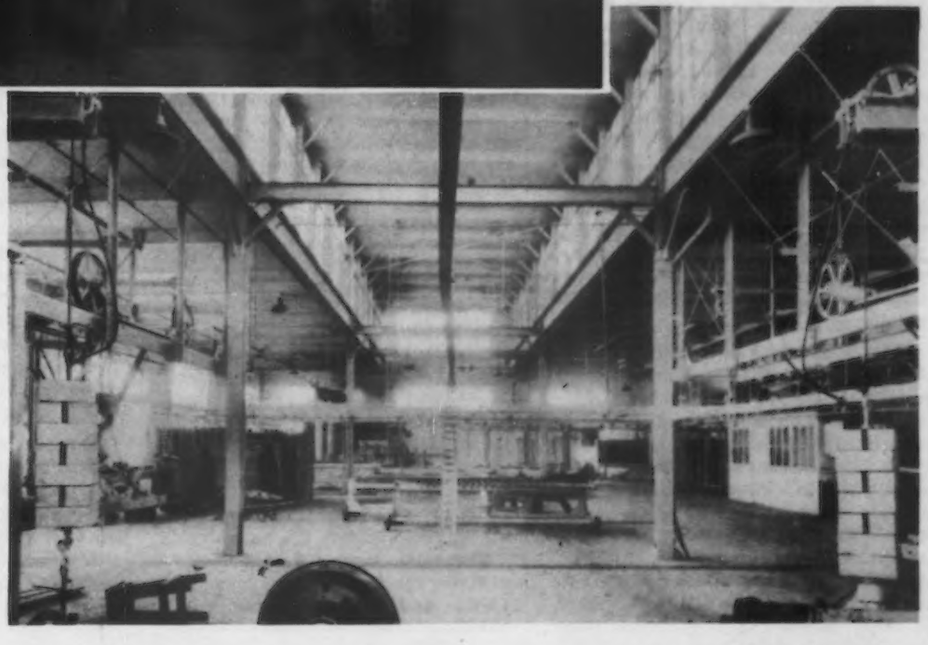
With White Paint

By J. A. MEACHAM
Plant Conditioning Engineer, Sherwin-Williams Co., Cleveland

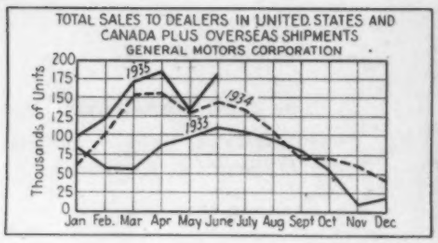
conditions and operating efficiency. By means of the sight-meter, designed to measure the foot-candles of light at any given point, it was possible to plot the illumination at 6-ft. intervals both before and after painting and prepare a graph for study. From this graph the varying levels of light could be observed and the planning for machines or operations made accordingly. In all cases in this particular plant the recommended minimum of 10 foot-candles of illumination for production floors was achieved by utilizing the reflection values of a good grade of white paint. Where windows were adequate the levels ranged much higher. Other areas, formerly unusable without electric lights, became sufficiently light after painting to be usable with only daylight.

Readings taken in two bays of the monitor-type section of the plant before and after painting showed

(CONTINUED ON PAGE 78)



ENAMELING building of American Stove Co., Lorain, Ohio, before and after painting. The "before" picture was taken at 3 p.m. Feb. 25 with a long exposure. The "after" photograph was taken 4 p.m. March 12.



THIS WEEK ON THE

First Major Steel Buying for New Models Expected This Week

DETROIT, July 16.

ALTHOUGH retail sales show signs of galloping through the summer without any substantial slackening of pace, the major attention of automotive executives is focused on preparations for 1936 models. The sales advantage the last two years has gone to those companies which have been out early with new lines and which have had plenty of cars to supply the retail demand. Keenly aware of this fact, the entire industry is aiming to be on the starting mark not later than Nov. 2 with ample stocks in dealers' hands.

Patterns and castings for dies for the new models have mostly been completed and die shops now are busy on the machining work. It is estimated that around $2,500,000 has been spent for patterns and castings for dies, an amount considerably higher than for 1935 models. Die shops in the Detroit area are operating at a brisk rate and are expected to clean up the bulk of the current business by or before Oct. 1. Orders for tools, jigs and fixtures have not yet reached a seasonal peak, since they usually lag somewhat behind the placing of die work.

The bulk of the die business for 1936 cars which has gone to outside shops is reported to have remained in the southern Michigan district. This is to be expected, since these shops are specially equipped to handle automotive orders and are close to motor car plants so that changes can be made with a minimum of delay and confusion. The labor situation seemingly is tranquil, although the specter of past difficulties still hovers over the local market. The best example of its damaging effects is the course pursued by Chevrolet.

Die Work Placed in East

Above everything else, Chevrolet is determined not to be halted the coming year by labor trouble. For the first time in several years, it has let out an important part of its die work. To make doubly sure that it would not be caught in a jam by any possible labor unrest, it placed this business in the East where operations can proceed far removed from the Detroit district.

With virtually the whole industry committed only to minor changes for next year, new dies are principally for fenders, hoods and radiator grilles. Since manufacturers are agreed that 1936 is likely to surpass this year in volume of output, more duplicate dies will be built than for several years.

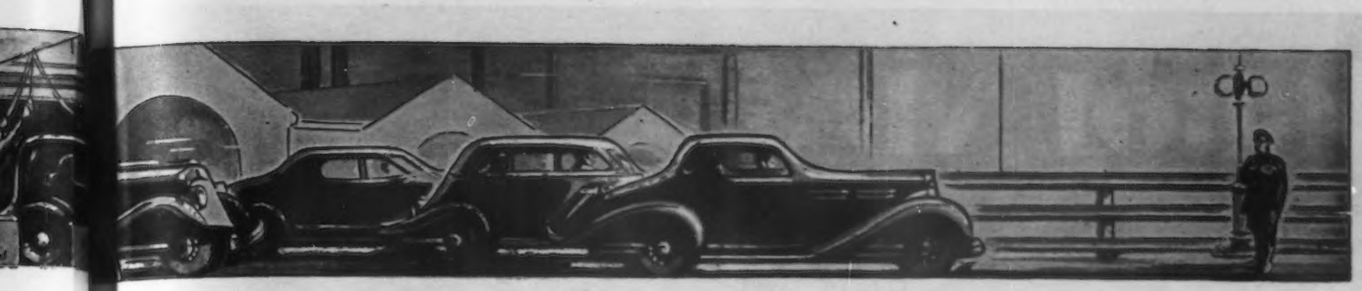
Chevrolet is speeding its program of diversifying operations at its various plants so that it will have more than one source of supply within its own ranks in case of labor difficulties. About $1,500,000 of the $5,000,000 to be expended at the local gear and axle plant will go for machine tools, the remainder being spent for other types of equipment, tools, jigs, fixtures and dies.

Chevrolet Expands Operations

Flint was the meeting place of machine tool builders the past week as Chevrolet swung farther into action on its buying program for its Flint and Saginaw factories. A large chunk of machinery business is to be allotted in connection with the establishment of Saginaw operations, but most of it won't materialize for two or three weeks. Chevrolet is transferring to Saginaw from the gear and axle plant at Detroit all of the manufacture of service parts. Saginaw, likewise, will be a major source of supply for Chevrolet transmissions. Bay City activities are also to be expanded. It is understood that some parts will be fabricated there for Chevrolet's hydraulic brakes, which will be a feature of the new models.

Pontiac is about to buy a few individual machines for its crankshaft and cylinder block lines duplicating equipment already installed and has placed a few orders for rebuilding of machinery. The plan is to tool up the Pontiac plant for an anticipated production of 40 six-cylinder engines an hour, an increase of about 10 units an hour over present capacity and of 20 to 25 eight-cylinder engines, which is approximately the same as this year. This would give a total production next year of 1300 to 1400 units a day with Pontiac operating on a full schedule. Oldsmobile has just completed installation of nine diamond boring machines for boring and turning pistons for 1936 models.

The program of fall introductions of new cars specifies that public announcements shall be made between Aug. 1 and Nov. 30. It is believed, however, that there will be few entries early in that period. LaFayette apparently will be first. While it has released a description



ASSEMBLY LINE

Detroit Editor, The Iron Age
BY BURNHAM FINNEY

o o o

of its 1936 line, which features an all-steel top, the advertising will not start until next month. Incidentally, Nash sold 12,667 cars in the first five months of 1935, compared with 8497 in the same months a year ago, the gain having been made entirely in the LaFayette division.

Buick Set to Go

Buick is set to go at full speed on its new jobs, being in a position to announce its new cars within a short time if deemed desirable. However, the public debut will not occur until after Sept. 15. Buick's increase in sales the past year is due almost solely to the success of its lower-priced 40 series, which will be pushed harder than ever the coming year. Buick has given some steel releases for parts for its 1936 cars as well as for Oldsmobile parts which it makes at its Flint plant. Initial production of 1936 Buicks is now getting under way.

Lincoln is said to be preparing to start the manufacture of its medium-priced V-12 about Aug. 1. New machinery, conveyors and other equipment have been installed at the local Lincoln plant to take care of the anticipated production volume. Competitors, such as Packard with its 120 series and LaSalle, are wondering what effect the new line will have on their volume.

The fourth quarter looks good to the industry. Best proof is the fact that at least one major company has advanced the date on which it expects to buy steel for its new cars partly to make sure that it gets steel when it wants it. While it will not need the material until around Aug. 15, it will place orders this week for 40,000 to 50,000 tons of sheets and strip steel which mills can roll at any time and deliver next month. This transaction will be the first real test of steel prices in the Detroit district, particularly because the company is seeking to buy on an f.o.b. mill basis. It wants to buy steel, for instance, at such Lake ports as Buffalo and Cleveland at the base price in those cities and transport it to Detroit by boat at its own expense. It likewise wants the equivalent of a Detroit base price on steel made in this city, plus a switching charge to its plant. This base price, in its opinion, should be the same as the Pittsburgh base price, since steel manufacturing costs at Northern points are substantially the same, whether mills be located in Pittsburgh, Cleveland, Detroit or Chicago.

Other automobile companies are expected to be in the market before the end of this month for steel for 1936 models. By the middle of August it is believed that considerable steel tonnage will have been placed.

Pressure from automobile manufacturers for lower parts prices for 1936 is understood to have been less than anticipated. New parts contracts run until the end of the year, covering new model requirements, and probably will be automatically renewed for the remainder of the model runs.

Motor car production is continuing at a gait which will yield assemblies of 275,000 units this month. Chevrolet and Packard are straining to turn out every car possible and Pontiac and Oldsmobile have comfortable July schedules. Chrysler is building around 16,000 units a week. Nash is busy stocking dealers with the new LaFayette and supplying the retail demand for its new Nash 400.

The Cummins Engine Co., Columbus, Ind., is preparing to produce in limited quantities a Diesel-engined passenger car with chassis supplied by an important automobile manufacturer. The motor will be of aluminum weighing around 800 lb. Another Diesel engine of cast iron will be built for truck and bus service. It is likely that the car will be assembled at the plant of the manufacturer furnishing the chassis. C. L. Cummins recently drove his Diesel-powered Auburn from Coast to Coast at a fuel cost of $7.63.

Detroit Notes

Oldsmobile and Pontiac are running a neck-and-neck race. In the first half the former built 104,003 cars and the latter 107,038. Oldsmobile sold 86,045 cars and Pontiac 83,317. . . . "My biggest job these days is in distributing wealth in a form that people can use," proclaimed Henry Ford when he announced that world production of Ford cars in the first six months totaled 848,504 units. Output in the United States and Canada was 810,700. . . . Chevrolet built 122,300 cars during June and sold in the United States 97,862. It assembled in the first half over 60 per cent of the volume made in all of 1934, despite serious labor and production troubles. It has sold 107,727 more Standard passenger cars than in the comparable period a year ago.

THE FIRST SIX MONTHS

	1935	1934	Year
Production (U. S. & Canada)	2,348,606	1,714,339	37%
Passenger Car Registrations .. (U. S. only)	1,446,580	995,555	45%
Commercial Car & Truck Registrations ..... (U. S. only)	255,620	194,744	30%

PRODUCTION OF BIG THREE—1935
Ford, 848,504
General Motors, 888,560
Chrysler, 486,578

MAKE A GOOD MACHINE BETTER

The modern gear is precision ground. It travels at high speed—quietly — and transmits heavy loads. It is heat treated by simple methods to produce the full hardness and toughness characteristics for its particular job. Hardening distortions mean nothing. They are removed by the grinding.

Extensive tests have shown that common errors in unground hardened gears can cause tooth loads more than twice as great as the load for which the gear was calculated. This causes noisy operation, and eventually failure. There is a pronounced difference in the running qualities of gears accurate to .0005″ and those accurate to .0002″. The latter tolerance produces excellent practical results, and can be obtained easily by grinding.

Gear grinding no longer is an expensive operation. The added advantages of simplified heat treatment and easier assembly often offset entirely the extra cost of grinding.

Wherever gears are used, hardened and ground gears do a better job. They are going into every conceivable mechanical product. Be sure that the gears in your newly designed machines are ground. We can show you how to grind them.

PRATT & WHITNEY CO.
HARTFORD, CONN.

A S.T.M. Committees Report Corrosion and Metallographic Data

(CONTINUED FROM PAGE 28)

objections are not necessarily to be regarded as adverse criticism of the accuracy and care with which the tests are made. The limitations imposed by the small size of the usual specimen, the relatively short duration of the test and the failure of the conditions under which the tests are carried out to simulate the essentials of those expected in service are often very serious ones. Evaluation of any material by actual service is, of course, ideal but usually this is not practicable. Whether or not such an evaluation can ever successfully be made by any test, short of service, is a matter of conflicting opinion. However, the possibility of developing a testing procedure which is substantially free from the really serious objections to which the ordinary corrosion test is subject is of decided interest.

The paper on corrosion testing of steel pipe described the method of accelerated testing used by the Bureau of Standards with considerable success.

The method consisted essentially in circulating water of known characteristics through a system built up of sections of the pipe to be tested. The sections were large enough to be representative of the pipe and still not beyond the limits of laboratory use. The test samples consisted of sections of pipe approximately 5½ in. in length having an inside diameter of approximately 35 sq. in. A number of specimens, usually 14, were assembled into a column with a hard-rubber washer separating adjacent specimens to prevent electrical contact. Water was passed continuously through this column. The pH value of this water ranged between 7.6 and 7.9. Some CO_2 was occasionally passed into the water to lower the pH value to 6.

Two Steels Used

Open-hearth steel pipe having an internal diameter of 2 in. and a wall thickness of 3/16 in., manufactured by the electric-resistance or flash-welding process, was used. The inner line of the weld was planished off so as to remove the slightly projecting "flash." The composition of the two types of steels which were used is as follows: Steel K: carbon 0.10, manganese 0.45, phosphorus 0.014, sulphur 0.027, silicon 0.005, and copper 0.30; Steel F: carbon 0.11, manganese 0.43, phosphorus 0.012, sulphur 0.029, silicon 0.005, and copper 0.12. Material K was used for most of the tests reported here.

Examination of specimens used in preliminary runs indicated the distribution of corrosion to be influenced decidedly by the swirling flow of the water in the pipes, the preferential attack of specimens at the inlet end being greatly pronounced. The corroded surface showed a spiral pattern indicative of the swirling flow of the water. By inserting a bundle of parallel glass tubes (5/16 in. inside diameter) in the lower end of the feeding head and by smoothing the rubber washers and junction of adjacent specimens, conditions were greatly improved.

It was found that a maximum corrosion rate occurred at the inlet, with progressively lower corrosion rates for specimens constituting the upper half of the column which was quite characteristic for slow rates of water flow. *By increasing the corrosion period, this difference in corrosion rate tended to decrease.* A considerably higher flow rate was more effective, however, in producing fairly uniform corrosion rates throughout the column.

There was an apparent increase in average corrosion rate (loss of weight, milligrams per square decimeter per day) of the same specimens used in successive runs under the same conditions. The change from one type of water to another of different characteristics undoubtedly does cause a change in corrosion rate. Other changes in corrosion rate are probably only *apparent* and are the result of progressively increasing surface roughening. This was apparent when the tests were made on specimens from which the previously corroded inner surface had been machined off.

The appearance of the corroded inner surface of the pipe specimens shown in Fig. 1 is typical of the specimens corroded in the manner described. All specimens used consecutively in a series of runs in tap water had the mottled appearance shown. Apparently this is characteristic of the action of a scale-forming water. In these tests this pattern persisted even though the final corrosion of the specimens was carried out in the more corrosive softened water. It did not form, however, on the same materials, freshly machined, when corroded in the softened water. The deposition of scale simultaneously with corrosion apparently has a marked effect on the distribution of corrosion. The reticulations or network (lighter areas, Fig. 1) were in relief and were not so severely corroded as the darker intervening patches. That the mottled surface condition is closely associated with scale deposition was readily demonstrated when the surface was cleaned by pickling. Although the mottled appearance persisted from one run to another, the surface being chemically cleaned between runs, there is no assurance that the pattern in one run was maintained essentially unchanged in the succeeding run. In spite of this factor, however, the average corrosion losses of the specimens constituting a column were surprisingly uniform in most cases if the flow rate was not too low.

Corrosion in Sulfuric Acid

In the report of committee B-3 on the corrosion of non-ferrous metals and alloys, two subcommittee reports showed sufficient data to enable the development of some significant conclusions.

Section 4 of subcommittee VII presented data on the corrosion of various metals in sulfuric acid (steel pickle solutions).

Three series of tests had been completed during the past year, one series in each of three test locations. The details of past tests were given in last year's report of the committee. The present series of tests were conducted under conditions identical with those already described except in series D, test location No. 31. Red Dog flour was used as an inhibitor, while in series C, test location No. 33, Rodine at the rate of 1 qt. per 100 gal. of pickling solution was used. The results are given in Table II. All tests were conducted in a com-

mercial iron pickle solution containing relatively large amounts of iron salts. It is quite possible that the iron salts are largely responsible for the corrosion of certain of the specimens. Tension tests on the specimens have not been completed but will be reported next year when a summarizing report completing the work of this section will be submitted.

Atmospheric Corrosion

Subcommittee VI of Committee B-3 offered an extensive report on atmospheric corrosion of a variety of non-ferrous metals and alloys. Part of this report dealt with data on changes of tensile properties of the specimens after an exposure of one and three years.

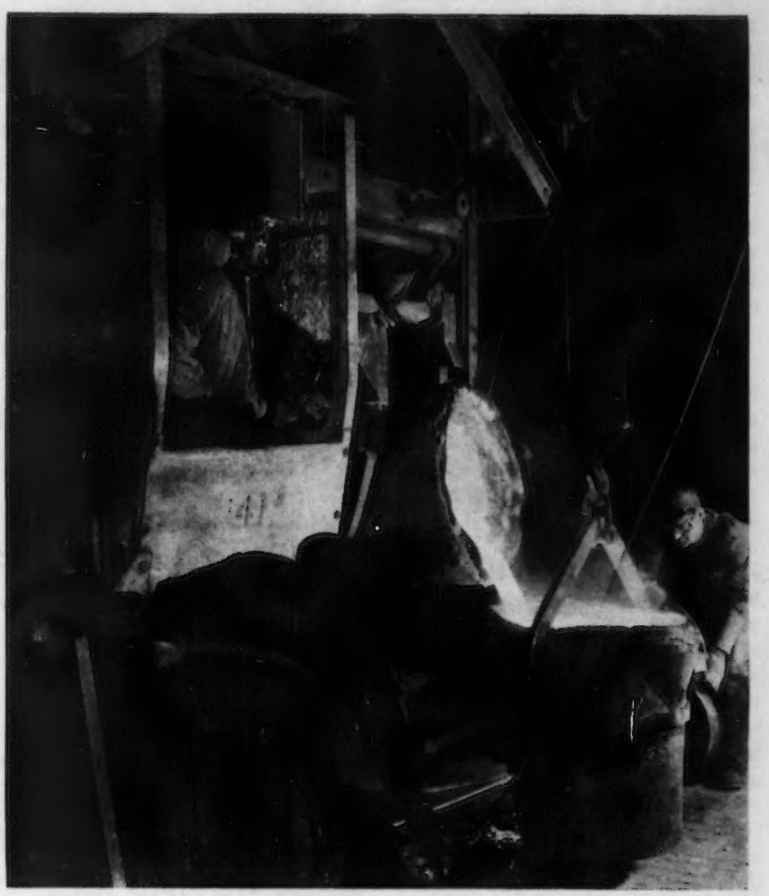
A statistical analysis has been made of the two sets of tensile data, that is, the results of the test made after 1 year and after 3 years' exposure. The study was made to determine what part of the changes in the tensile properties are due to chance variations in (1) the original materials, (2) the testing methods and machines, (3) the aging properties as distinguished from changes in the tensile properties due entirely to *corrosion*. Therefore, any percentage *loss* in tensile strength or elongation greater than the figures, italicized in parentheses in the tabulations, representing maximum percentage difference due to chance can be attributed to *corrosion*.

A review of the tensile strength and elongation percentage change figures for both the 1-yr. and 3-yr. tests, giving due regard to the "maximum percentage difference due to chance values," shows that so far only a few of the materials have experienced a *large* amount of corrosion in either the industrial or marine atmospheres. The corrosion of all metals and alloys was negligible in rural atmospheres. However, in many cases sufficient corrosion has occurred to permit rough classifications of the materials into several groups based on their corrodibility as indicated by the tensile data.

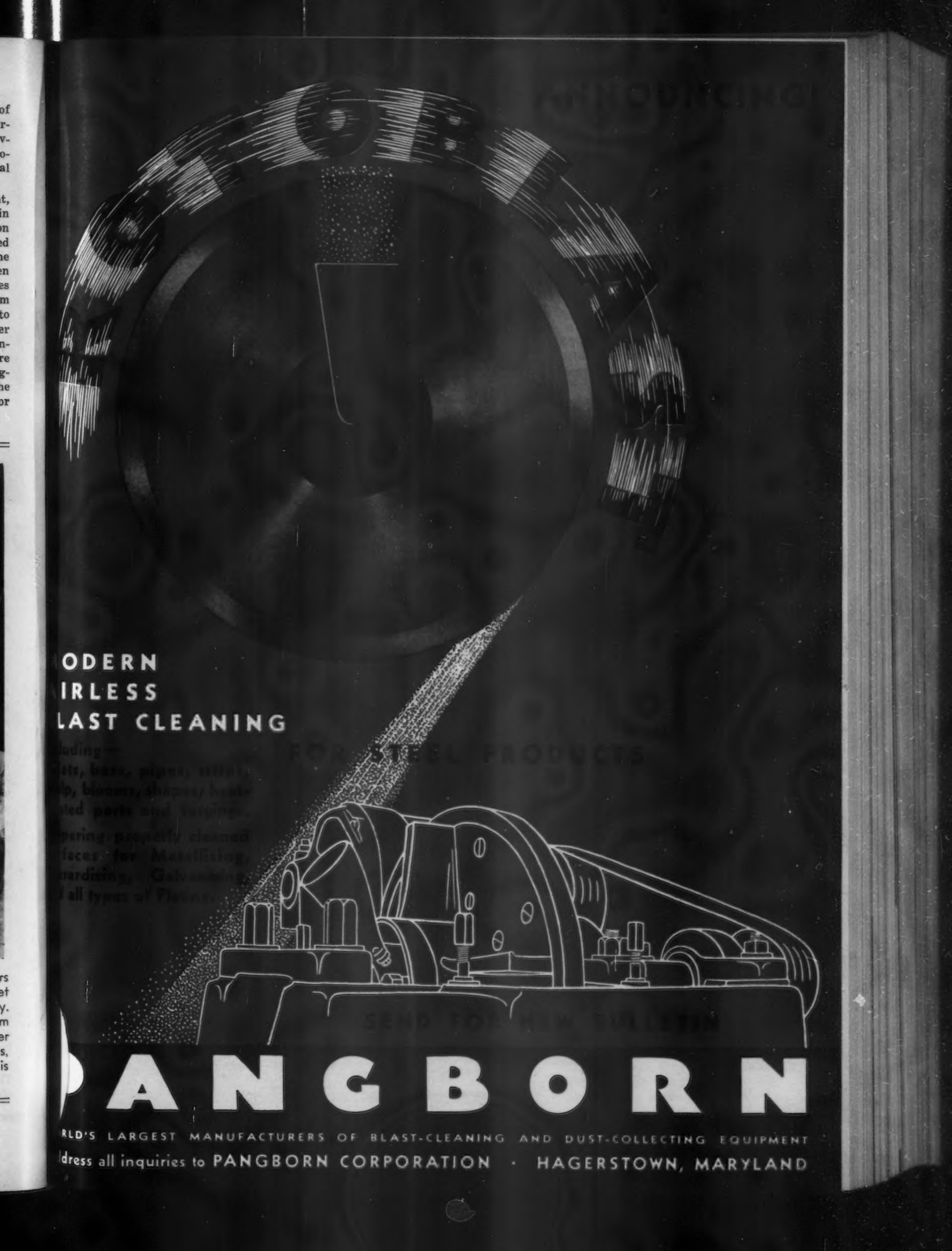
It has been noticed that in some instances the 1-yr. and 3-yr. results (percentage change in tensile properties), when considered with their respective "maximum percentage difference due to chance values," are not consistent, which would seem to indicate that, in some cases at least, all the differences due to chance are not covered by our calculations. These inconsistencies may be due to the fact that our calculations are based on too few individual test results or may be an indication that the materials themselves, or the testing methods used, vary too widely to allow the resulting data to be classified as homogeneous (that is, produced under "controlled conditions"), in which case the formulas used in the calculations could not be applied to a statistical study of the test data without reservations.

Although it would be desirable at this time to discuss those materials which already show a substantial amount of corrosion, it is difficult to do so without making the comment unduly long and, furthermore, it runs the danger of placing too much emphasis on certain of the test results without giving due consideration to the corrosion idiosyncrasies of the individual materials.

In lieu of such written comment, Table III has been prepared in which the amount of corrosion shown by the materials is classified as "negligible" (left blank in the tables) if the differences between the "percentage change" figures and their respective "maximum percentage difference due to chance" values are less than 1 per cent, and classified as "small" (indicated by *s*) if the differences are from 1 to 3 per cent and as "significant" (indicated by *X*) if the differences are 3 per cent or greater.



MODERN equipment, efficiency of organization and skilled workers enabled Chevrolet's gray iron foundry at Saginaw, Mich., to set a new record recently of 2306 tons of iron poured in a single day. Traveling electric cranes carrying large ladles receive the metal from the cupolas and speed it about the plant to be transferred to smaller casting ladles, from which it is poured into molds to form cylinder blocks, pistons, clutch housings and other castings. Here the electric crane is discharging its load.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RLD'S LARGEST MANUFACTURERS OF BLAST-CLEANING AND DUST-COLLECTING EQUIPMENT
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Improvements in Production

Hydraulic Straightening Press Features Lever Stop-Control

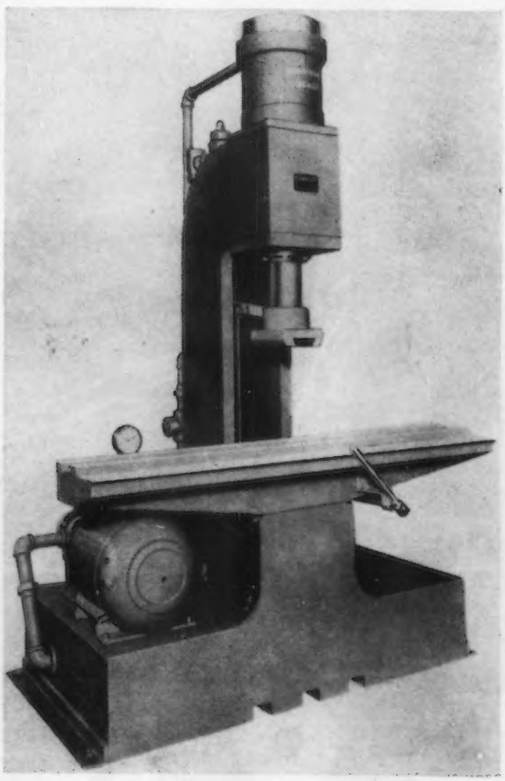
A NEW type 35-ton hydraulic press especially designed for straightening operations on axle shafts, crankshafts, and similar work requiring accurate straightening, has been developed by Hannifin Mfg. Co., 621-31 South Kolmar Avenue, Chicago. Simplified handling of straightening operations and increased production are said to be inherent in the design of the control mechanism. A single lever controls the entire operation of the ram, giving an extremely sensitive proportional control action. When the control lever is moved in either direction the ram will move a proportional distance and then stop by automatically bringing the operating valve to neutral. Thus the operator, merely by moving the one operating lever, obtains a ram movement at 35 tons pressure through the exact distance required for straightening the particular work piece. An accurate ram movement, either up or down, of as little as 1/16 in. may be obtained. The arc of movement of the control lever is approximately three times the ram stroke, providing for sensitive handling without requiring special skill.

The hydraulic power unit, with constant delivery type rotary pump, is built into the base of the press, making a self-contained unit requiring approximately 19 sq. ft. of floor space.

The ram delivers 35 tons pressure, and may be fitted with any type of fixture required for handling parts to be straightened. The stroke is 6 in. Speeds are: power stroke, 53 in. per min. and return stroke, 77 in. per min. Dimensions: table to ram (up), 20 in., center of ram to face of frame, 9 in.; length of table, 70 in.; floor to table, 36 in.; overall height, 98 in.; and base, 38½ x 69 in. Special fixtures are available for all types of straightening operations.

Improved Equipment for Chaser Grinding

LANDIS MACHINE CO., Waynesboro, Pa., has recently added to its line of machines and fixtures for grinding Landis die-head chasers. A new chaser grinder, Model O, illustrated herewith, is suitable for grinding all chasers up to 1¼ in. wide. Either bench or pedestal type machine is available. Two grinding wheels are employed, one 6 in. x 2 in. cupped



THE straightening press, at the left, has ram movement of 35 tons. As little as 1/16-in. movement, either up or down, is provided for. Single lever control is an operating feature.

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ADJUSTABLE fixtures, at each side of the machine as shown below, make up a complete unit for the grinding of Landis die-chasers.

and Shop Equipment . . .

shape, one 7 in. x ½ in. straight.

The right hand side of the machine is fitted with a fixture for grinding the rake and lead angles. The fixture is swiveled to obtain desired angles; a graduated scale facilitates angle determination. The fixture is mounted on a rotatable spindle which permits oscillating the chaser against the face of the cup wheel. Cross feed is obtainable through a hand-knob on the left side of the machine bed. The chaser is held in the vise by its dovetailed bottom and is securely gripped.

An adjustable fixture is also attached to the left hand side of the machine for grinding the "lip" in the rake angle. A grinder is attached to the table of this fixture to control the lead angle.

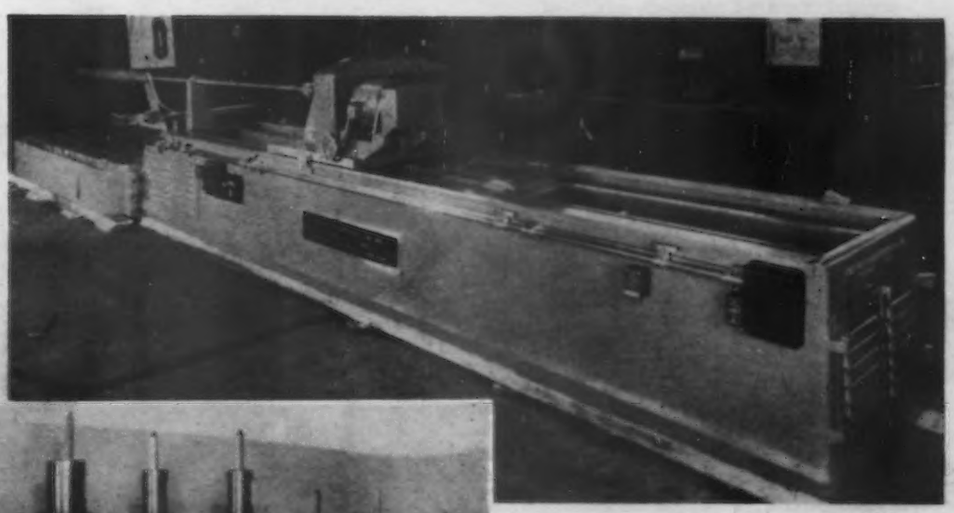
The grinder is equipped with a 1/3 hp., a.c., single phase, 120 volt, 60 cycle, fully enclosed motor, suitable for plugging into a light socket providing the proper current.

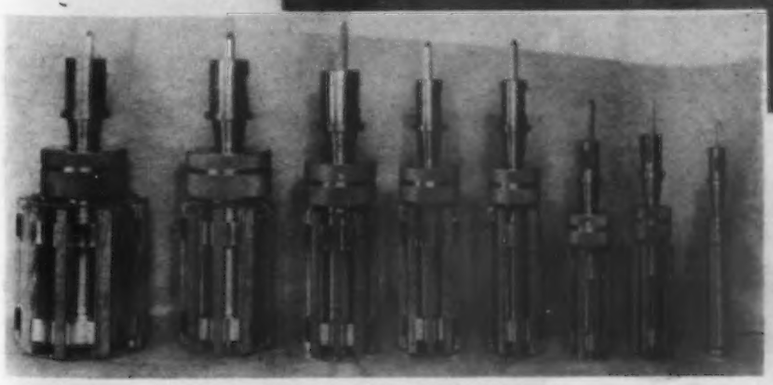
Hydraulic Honing and Lapping Machine Flexible Under All Range Conditions

THE illustrations herewith are of a new hydraulically reciprocated honing and lapping machine, and of the equipment for use on its detachable driving universals. The Hutto Engineering Co., Inc., Detroit, makers, identify the machine as Model M H-1800 H., and specify capacity as 1½ in. to 12 in. diameter bores, requiring strokes from a 2-in. minimum up to 13½ ft. Both the reciprocation and the rotation speeds are said to be infinitely variable; reciprocation from 0 to 50 ft. per min., rotation from 53½ to 252 r.p.m. The reciprocation motion is hydraulically produced and is transmitted through automatically lubricated gears, thus avoiding such adjustments as might be required if otherwise transmitted. Length of reciprocation stroke is adjustable through limits arranged along the machine bed. The rotation drive is mechanical. Rotation speed for lapping operations is intermittent at extremities of reciprocation infinitely adjustable from 0 to ½ revolution per cycle of reciprocation. Operation is completely automatic with electric stroke-counting and controlling device, adjustable from 1 to 999 cycles of reciprocation, for automatic stopping upon completion of predetermined time, as indicated by adjustable setting. Panel control of electrical power units is enclosed in a ventilated chamber at the end of the machine, away from dust, dirt and moisture.

The base is of welded steel construction. The work table end of the machine contains a 200-gal. coolant reservoir, settling tank and cartridge-type filter. Platen positioning allows easy access to reservoir. A sediment ring is provided. Distance from floor to top of table is 15 in. Distance from work table to center line of work spindle is 27¾ in. Overall length 27 ft. 11 in. Width of bed 4 ft. Width of

THE design of this honing and lapping machine provides that the work table is, practically, separate from the power end of the machine. Yet power control is within easy reach of the operator. The driving universals are detachable and a wide variety of honing equipment can be conveniently used.





work table 5 ft. 2½ in. Length of work table 8 ft. Approximate weight 24,000 lb.

The machine illustrated was given its first test in refinishing a 100 m.m. recoil cylinder, 92 in. long. Existing error was: out of round 0.003 in., tapered 0.007 in. Previous time for correcting such total error was 3 hr. The machine illustrated reduced the time to 35 min. in obtaining star-gage reading showing the cylinder to be within 0.00025 in. of size from end to end. The saving in honing time of 84 per cent is said to have been accomplished under requirements of Governmental tests.

Press Clutch Employs Multiple Jaws and Splines

A 14-POINT engagement, sleeve type, clutch is announced by the Niagara Machine & Tool Works, Buffalo, N. Y., for use on its line of power presses. The 14 jaws distribute the load over a striking surface of many times the previous area. Time lag between depression of treadle and clutch engagement is said to be practically eliminated. When the clutch is engaged, the shaft is controlled in both forward and backward directions. The driving force is equally applied at 14 points arranged in a circle which is concentric with the driven shaft. Shock is not transmitted to the clutch wheel bearing; this permits of the use of anti-friction bearings in the flywheel or main gear.

The 14 - jaw clutch face is a solid, hardened and ground steel forging. Assembly with the clutch wheel involves a special arrangement, eliminating fitted keys, pins, etc. The hardened alloy steel clutch sleeve with its 14 jaws slides laterally on the crankshaft when engaging or disengaging with the wheel facing. When the sleeve is engaged, driving energy is transmitted to the crankshaft by 26 internal splines generated on the inside of the clutch sleeve bore. These are in constant mesh with corresponding external splines on the crankshaft. There are 26 possible stop positions, any one of which may be utilized by mounting the clutch sleeve in proper radial position.

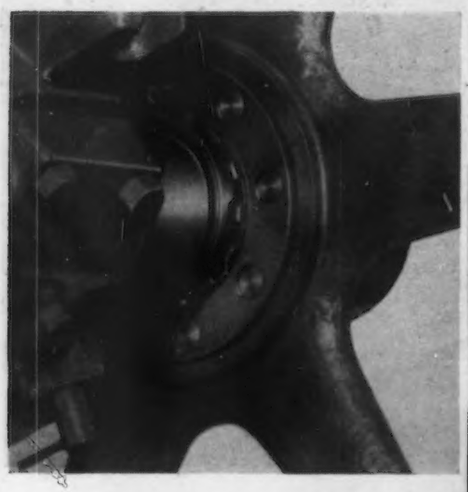
A large concentric spring slides the clutch sleeve into engagement when the treadle is depressed. At the end of the selected stroke, the sleeve is withdrawn by a cam-race machined in the sleeve. This is engaged by a hardened, alloy steel, follower spindle, mounted on long anti-friction bearings. To prevent forward drift of the shaft, in the event of improper braking, and to prevent the possibility of repeating, the throw-out spindle encounters an abutment, stoping the shaft at the limit of allowable drift. The throw-out has a positive locking device which may be locked or released while the flywheel is rotating. A single stroke, non-repeat, device is a feature of the sleeve clutch; the treadle must be depressed a second time for a second stroke. For constant engagement, the single stroke device is locked out of engagement by a knurled sleeve.

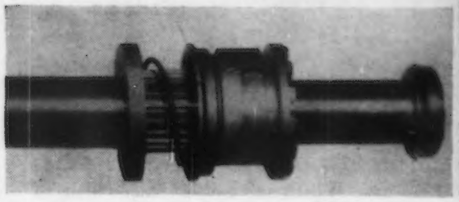
Tube Bending Machine Employs New Method

FRANK AUTOMATIC BENDING CO., INC., Cincinnati, has developed the power driven tube bending machine shown below.

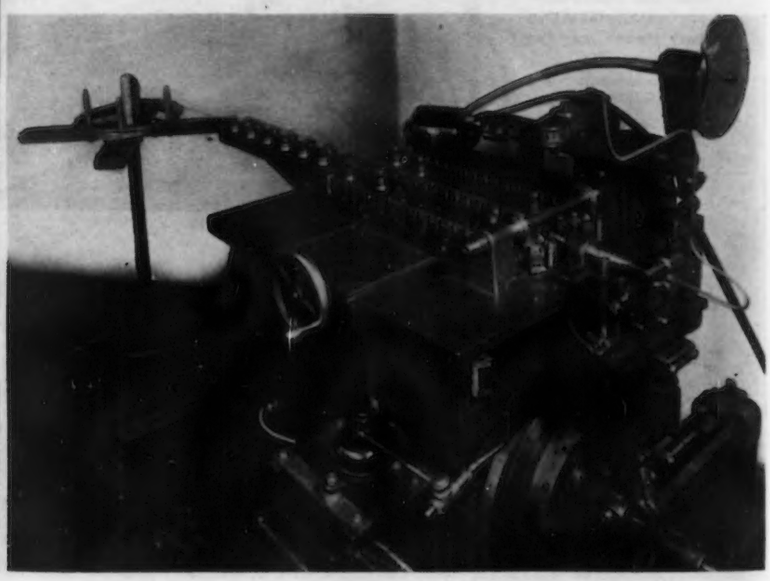
In operation the tubing is fed into a straightening unit, after which it is gripped by a continuous conveyor unit, which pushes the tubing through a bending unit which is automatically oscillated by a cam mechanism giving the required bends.

It is said that neither the con-





A CONVEYOR method of pushing tubing through a bending unit is said to result in the elimination of defective bends such as are due to kinks, splits or crushed work. Necessity for using any of the usual tube fillers is avoided.



veyor unit, at the time of gripping, nor the bending unit, at the time of bending, will crush, kink, or split the tubing. Also that coils can be bent without filling the tubing with sand, resin, oil under pressure or any substance commonly used to prevent tube deformation during the bending operations. Tubing can be bent in a horizontal and vertical plane in one continuous operation.

The machine was primarily developed for bending cylindrical tubing of copper, brass, aluminum, etc., in diameters from ⅛ in. to ½ in. inclusive. However, rectangular wire has been coiled edgewise very successfully. The machine will adapt itself to the bending of solid bars, and square, hexagon and octagon tubes within reasonable bending limits.

The machine illustrated weighs approximately 3000 lb.

Intermediate Spring Tester Has Pendulum Scale

AN intermediate size spring-testing machine is announced by Coates Machine Tool Co., Inc., New York. The machine is designated as type RP "Elasticometer" and is built in two load ranges, RP-200 from 0-100 lb. and from 0-500 lb., while RP-300 has range 0-100 lb. and 0-750 lb.

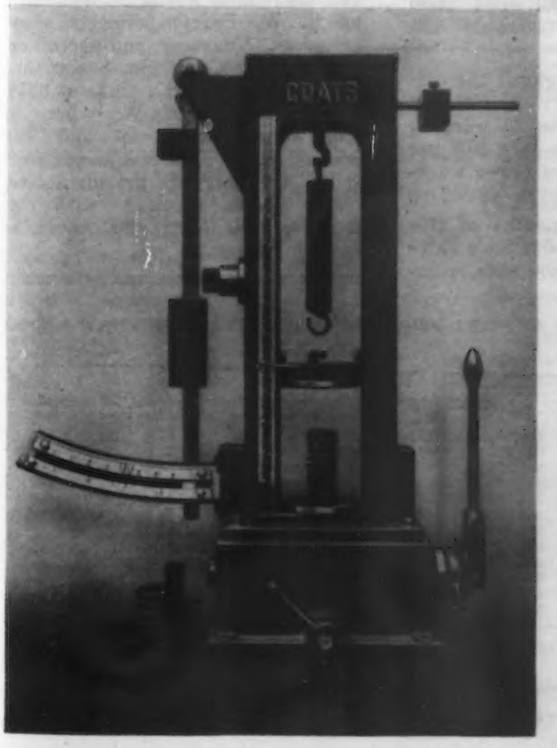
The drive is by two racks, guided within the frame of the machine and actuated by means of hand-lever and pinions. The racks are connected by the cross-head, which is provided with a large bore for the entrance of arbors or pilots when testing slender compression springs. A tension hook screws into the cross-head for testing tension springs. A dog-clutch is employed in the hand-lever and pinion mechanism. Outward movement of the hand-lever, sideways from the driveshaft, provides easy engagement or disengagement. Brake pressure, applied to the driveshaft at the instant of clutch disengagement, maintains tension on springs when tests require any considerable spring length changes. This brake pressure is applied by a ball-top grip near the center of the base. The stroke of the racks can be automatically governed by a stop on the driveshaft and located at the dog-clutch. This can be set regardless of the number of turns to be made by the shaft. This automatic stop is said to permit of an inspection rate of approximately 600 springs per hr. when the length variation is not too great.

The weigher scale consists of a single beam. The lower compression plate and the upper tension hook are suspended from this beam. There is in addition a load-indicating pendulum in a knife-edge bearing and a steel ribbon transmitting the motion of the beam to the pendulum. A detachable weight on the pendulum permits the testing of weak springs with accuracy equal to that of heavy spring testing. The advantage of pendulum automatic load indication as also tolerance markers on the scale sector, adapt the machine for quantity inspection. To balance the dead weight of springs under test, and pilots, a counterpoise, slidable along the bar, is provided. Rubber buffers protect the weigher scale against sudden jars from the quick loading or unloading of stiff springs.

A vertical length scale is attached to the lower compression plate and therefore must follow either the path of the plate or that of the upper tension hook. Readings taken from the index pointer must always measure distance between compression plates or tension hooks, independent of any frame deflection caused by force of springs under test.

Calibration is effected by placing weights on the lower compression plate or by suspending weights from the upper tension hook.

The distance between compression plates is from 23½ in. to 35 in. The distance between tension hooks is from 20 in. to 33 in. Diameter of compression plates is 5½ in. Approximate weights, 240 to 275 lb.



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THIS spring tester, designated as "Elasticometer," is for testing the intermediate sizes of springs. The equipment, designed for rapid testing, is built in two load ranges, each with convenient scale readings. Special provision is made for testing weak springs with accuracy equal to that of the heavier work.

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Repeat Device Provides Flexible Time Control

A MECHANICALLY redesigned instrument, in a new series of electric time controls, announced by Automatic Temperature Control Co., Philadelphia, now operates to repeat one or two cycles or processes as regularly as desired or with varying time periods of frequency. The time cycle and also the interval between successive cycles are said to be infinitely adjustable with an accuracy of setting within a split scale division of the respective dial ranges selected. Parts are so grouped that adjustments are simple. Jack connections permit removal of parts without disturbing wiring. Settings are said to be undisturbed by vibration.

Reinforcing Steel

Awards 4400 Tons—New Projects 10,020 Tons

AWARDS

Hartford, Conn., Metropolitan District, 128 tons, Bills Brook dam, to Concrete Steel Co.

New York, 1400 tons, approach to Midtown-Hudson tunnel, to Kalman Steel Corpn.

Olean, N. Y., 150 tons, school, to Kalman Steel Corpn.

Indianapolis, 1000 tons, housing project, to Laclede Steel Co.

State of Illinois, 150 tons, State institutional buildings, to Calumet Steel Co.

Chicago, 1300 tons, contract No. 1 for Sanitary District to Inland Steel Co.

Seattle, 275 tons, girls' dormitory at University of Washington, to an unnamed bidder.

NEW REINFORCING BAR PROJECTS

Staten Island, N. Y., 1500 tons, grade crossing at Mariners Harbor; bids July 30.

Wards Island, N. Y., 850 tons, sewage disposal plant; bids July 23.

Elizabeth, N. J., 125 tons, sewage project; general contract bids in.

Zanesville, Ohio, 500 tons, Pleasant Hill dam; Newhall-Herkner Construction Co., Cleveland, general contractor.

Chicago, 150 tons, postal substation.

Chicago, 130 tons, high school building.

Chicago Heights, Ill., 350 tons, Sanitary District project.

Genoa, Wis., 570 tons, dam No. 8.

Ashton, Idaho, 175 tons and 206 tons miscellaneous steel, Island Park dam on Snake River project; bids Aug. 5.

Ogden, Utah, 313 tons, construction on Ogden-Brigham canal; bids opened.

Hanford, Cal., 100 tons, reinforced concrete weir; bids July 30.

San Francisco, 1000 tons, 10-story building; Cahill Brothers, general contractors.

Los Angeles, 478 tons, Del Valle Avenue conduit; identical bids received.

Los Angeles, 756 tons, County conduit from Debris dam to Verdugo Wash; bids opened.

Los Angeles, 4000 tons, tunnels and pipe line on Colorado River aqueduct between Sierra Madre and Pasadena, Specification 110; bids July 30.

Los Angeles, 5125 tons, Cajalco dam, dike and tunnels near Riverside; Specification 112; bids advanced to Aug. 12.

Pipe Lines

Southern Natural Gas Co., Birmingham, plans new 18-in. welded steel pipe line in Morehouse and West Carroll Parishes, La., near Bastrop, for natural gas supply. Connection will be made with present system of company in same locality. Cost close to $100,000. N. R. McKay is company engineer.

General Purchasing Officer, Panama Canal, Washington, asks bids until July 30 for 5000 ft. of welded steel pipe, and 35,300 ft. of galvanized welded steel pipe (Schedule 3072).

Mid-West Pipe Line Co., Murray Building, Grand Rapids, Mich., Benjamin J. Skinner, head, recently organized, is considering new welded steel pipe line from gas field district at Gratiot and Montcalm, Mich., to Alma, Mich., for natural gas supply for Consumers Power Co., Jackson, Mich., which will distribute at Alma, St. Louis and Breckenridge, installing steel pipe lines for such service. Connection will be made with present trunk lines of Consumers company at Alma.

McKnab Oil & Gas Co., Winfield, Kan., represented by James A. Waechter, Telephone Building, St. Louis, attorney, is securing franchise from Board of Public Service, St. Louis, for natural gas supply for city. Welded steel pipe line will be built from natural gas fields near Bowling Green, Ky., to St. Louis by Panhandle Eastern Pipe Line Co., 101 West Eleventh Street, Kansas City, Mo., with which McKnab company has contract for line installation and piping gas to markets. Cost close to $4,500,000 including steel pipe line loop around St. Louis for commercial and industrial service.

Oklahoma Natural Gas Co., Oklahoma City, Okla., plans 4 and 6-in. steel pipe lines in West Point and neighboring districts, where franchise for natural gas supply has been secured. Cost close to $50,000.

San Antonio, Tex., plans steel pipe lines for natural gas distribution. Estimates of cost and surveys are being made by Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., consulting engineer.

Stanolind Pipe Line Co., Philcade Building, Tulsa, Okla., an interest of Stanolind Oil & Gas Co., same address, plans 8-in. welded steel pipe line from oil field district at St. Louis, Okla., to Maud, Okla., about eight miles, for crude oil transmission. Cost close to $50,000.

Quartermaster, Baltimore, will require 150 tons of steel pipe for 72 CCC camps in the East; bids July 18.

Railroad Equipment

Chesapeake & Ohio has ordered five passenger locomotives from Lima Locomotive Works, Inc.

Norfolk Southern will take bids July 22 on 500 box cars.

Philadelphia Rapid Transit Co. has placed an order with J. G. Brill Co. for eight 30-passenger trackless trolley cars.

RAILS

Milwaukee Road has placed 11,200 tons with two Chicago rail mills.

Illinois Central has ordered 4500 tons from Illinois Steel Co. and 3000 tons from Inland Steel Co.

Receivers of the **Seaboard Air Line** are inquiring for 12,000 tons of rails and accompanying accessories.

Chesapeake & Ohio has taken bids on 4000 tons of rails and 200 tons of accessories.

Steel Corporation's June Shipments Off Only Slightly—Daily Rate Higher

SHIPMENTS of finished steel products by the United States Steel Corpn. during June amounted to 578,108 tons, representing only a slight decline from the 598,915 tons in the preceding month, but comparing with 985,337 tons in June, 1934, when steel prices were being sharply advanced.

The June total engaged the corporation's finishing capacity at 36.7 per cent for the 25 working days, compared with only 35.8 per cent in May with two fewer working days.

In the first six months of this year, the Steel Corporation's shipments were 3,553,999 tons, compared with 3,678,895 tons in the corresponding 1934 period and with only 2,212,420 tons in the first six months of 1933.

The E. W. Ferry Screw Products Co., Cleveland, has been organized by E. W. Ferry, formerly vice-president, treasurer and secretary of the Ferry Cap & Set Screw Co., and has established a plant at 8219 Almira Avenue, S. W., where it will manufacture cap and set screws, acorn nuts and connecting rods. Mr. Ferry is president and G. S. Tighe, formerly with the Rustless Iron Corpn., Baltimore, is sales manager.

MONTHLY SHIPMENTS OF STEEL PRODUCTS BY UNITED STATES STEEL CORPN.

				1933		1934		1935	
Month	1930	1931	1932	Shipments	Per Cent of Capacity	Shipments	Per Cent of Capacity	Shipments	Per Cent of Capacity
January	1,104,168	800,031	426,271	285,137	17.7	331,777	19.8	534,055	31.9
February	1,141,912	762,522	413,001	275,929	18.5	385,500	26.3	583,137	39.2
March	1,240,171	907,251	388,579	256,793	15.3	588,209	36.6	668,056	41.5
April	1,188,456	878,558	395,091	335,321	21.6	643,009	41.5	591,728	36.7
May	1,203,916	764,178	338,202	455,302	27.1	745,063	44.4	598,915	35.8
June	984,739	653,104	324,746	603,937	37.4	985,337	61.2	578,108	36.7
July	946,745	593,900	272,448	701,322	45.1	369,938	23.0	.....	...
August	947,402	573,372	291,688	668,155	39.8	378,023	23.1	.....	...
September	867,282	486,928	316,019	575,161	35.6	370,306	23.0	.....	...
October	784,648	476,032	310,007	572,897	35.5	343,962	20.6	.....	...
November	676,016	435,697	275,594	430,358	26.7	366,119	22.9	.....	...
December	579,098	351,211	227,576	600,689	38.7	418,630	26.1	.....	...
Plus or minus yearly adjustment	(40,259)	(6,040)	(5,160)	(44,283)	...	(19,907)	...	.....	...
Total for year	11,624,294	7,676,744	3,974,062	5,805,235	30.1	5,905,966	30.6	.....	...

NEWS OF THE WEEK

Taxes Take 66c. Out of Each Dollar Of Net Income of Steel Industry

TAXES paid by the steel industry for the six-year period from 1929 through 1934 amounted to 66.4c. out of every dollar of the total net income available for the payment of taxes and for return on the stockholders' investment. This is revealed by data recently submitted to the American Iron and Steel Institute by 26 leading steel companies representing more than 93 per cent of the total steel capacity of the country.

Payments of Federal, State and local taxes by these companies have totaled $390,000,000 during this period. What this sum means in the steel industry is indicated by the fact that it represents an amount approximately equal to eight weeks' wages every year for each employee during the six-year period.

Net earnings of the 26 companies over the same period, after all charges except taxes and before the payment of any dividends to their stockholders, aggregated $587,900,000. However, in no year since 1930 have the 26 companies earned an aggregate net income (after all other charges were provided) sufficient to pay all taxes, with the result, therefore, that there was no aggregate net income available for payment of dividends to their 433,500 stockholders. For the entire six years, only 33.6c. out of every dollar of the total net income available for taxes and dividends remained for the payment of dividends, which was only 2.42c. out of every dollar of gross sales.

Finished steel production of these companies since 1929 has totaled 115,126,000 gross tons, on which the total taxes averaged $3.39 per ton. In 1929, when steel production and earnings were at prosperity levels, the payment of approximately $95,750,000 in taxes amounted to $2.78 per ton on the 34,435,000 tons of finished steel produced by the 26 companies. In 1932, however, at the low point of the depression, when deficits had practically eliminated Federal taxes, payment of approximately $52,125,000 in taxes amounted to $6.06 on each of the 8,605,000 tons of finished steel produced. In 1934, tax payments of approximately $56,230,000 (which again consisted of practically all State and local taxes) were equivalent to $3.47 per ton on the total finished steel output of 16,212,000 tons—a rate above the six-year average.

The proportion of all taxes paid to the gross sales of the 26 steel companies has ranged from a low of 4.0 per cent in 1929, when gross sales are estimated at $2,387,000,000, to a high point of 7.6 per cent in 1932, when gross sales had shrunk 71 per cent to $689,000,000. In 1934, gross sales amounted to $1,148,000,000, of which 4.9 per cent was paid out in taxes. Over the six-year period, gross sales ag-

TAXES PAID BY 26 STEEL COMPANIES SINCE 1929

	1929	1930	1931	1932	1933	1934	Total
Total net income earned available for taxes and for investment represented by stockholders' interests	$355,746,381	$248,776,184	$42,967,519	—$83,671,818	—$17,423,392	$35,522,474	$587,917,992
Total taxes consumed of same:							
State and local	$59,583,477	$57,521,028	$54,954,064	$51,646,818	$48,767,170	$48,541,966	$321,015,123
Federal	$36,162,904	$20,255,161	$1,912,855	$481,364	*$2,670,439	*$7,690,151	$69,172,874
Total	$95,746,381	$77,776,189	$56,867,519	$52,128,182	$51,436,608	$56,232,117	$390,187,997
Percentage of total net available required for taxes	26.9	31.3	**	***	***	**	66.4
Percentage of total net available for stockholders	73.1	68.7	None	None	None	None	33.6
Production of finished steel (gross tons)	34,435,000	25,210,000	16,110,000	8,605,000	14,499,000	16,212,000	115,126,000
Total taxes per ton of finished steel	$2.78	$3.09	$3.53	$6.06	$3.55	$3.47	$3.39
Total gross sales and earnings (000 omitted)	$2,387,000	$1,806,000	$1,202,000	$689,000	$948,000	$1,148,000	$8,180,000
Per cent of total taxes to gross sales and earnings	4.0	4.3	4.7	7.6	5.4	4.9	4.77

*Includes capital stock tax.
**In these years taxes exceeded net available.
***In these years there was a deficit before providing for taxes.

gregated $8,180,000,000, of which 4.8 per cent was paid out in taxes.

By reason of the depression and the resultant lack of earnings, Federal income taxes practically disappeared during the period from 1931 to 1934 inclusive.

Taxes paid to State and local governments declined less than 19 per cent, from $59,583,477 in 1929 to $48,541,966 in 1934. Over the same period, both production and gross sales dropped off more than 50 per cent. The study discloses that during the period under review, State and local taxes amounted to more than 82 per cent of the total tax bills which were paid by the 26 companies.

The accompanying table presents the above data for each of the six years under review:

Over 90% of Steel Workers Now Active in Representation Plans

MORE than 90 per cent of the employees in the steel industry are actively participating in employee representation plans as their method of collective bargaining, according to an industry-wide survey of recent employee elections just completed by American Iron and Steel Institute. One year ago a similar survey showed that employee representation plans were supported by 85 per cent of the employees.

Reports of election returns have been received from 20 steel companies, operating 67 units, whose employees went to the polls in June. These reports show that out of a total of 213,806 employees available and eligible to vote on the date of the election, ballots were cast by 192,699, or 90.13 per cent. Employees of several companies elect representatives in months other than June. Results of elections were not covered by the survey.

One year before, 181,926 employees, out of a total of 213,000 then qualified, cast ballots.

The purpose of the balloting by employees was to elect representatives to bargain collectively with representatives of management. As a result of last month's elections in the industry, nearly 1600 employee representatives were elected, more than half of whom were representatives reelected after service during the previous year. All of the representatives chosen are employees.

Elections in the various plants are conducted entirely by the employees themselves, the management of the companies taking no part in the elections under the provisions of the representation plans.

The following table shows the results of recent balloting for representatives for collective bargaining under employee representation plans in the steel industry:

	Numbers of Employees Available and Eligible to Vote	Total Ballots Cast	Per Cent of Eligible Voters Casting Ballots
United States Steel Corpn	132,605	115,506	87.1
Republic Steel Corpn	24,431	23,282	95.3
Jones & Laughlin Steel Corpn	15,273	14,978	98.0
Youngstown Sheet & Tube Co	14,847	14,350	96.6
Inland Steel Co	5,815	5,694	97.9
Pittsburgh Steel Co	3,793	3,475	91.0
Spang, Chalfant & Co., Inc	3,041	2,421	80.2
McKeesport Tin Plate Co	2,996	2,743	91.5
John A. Roebling's Sons Co	2,476	2,262	92.0
Sharon Steel Hoop Co	1,991	1,976	99.2
Interlake Iron Corp	1,048	953	90.9
Carpenter Steel Co	957	912	95.3
Babcock & Wilcox Tube Co	826	711	86.0
Follansbee Bros. Co	707	677	96.0
Harrisburg Steel Corpn	706	622	88.1
Page Steel & Wire Co	697	638	91.5
Worth Steel Co	550	500	90.9
Central Tube Co	451	403	89.0
Valley Mould & Iron Corpn	409	409	100.0
Fretz-Moon Tube Co	187	187	100.0
1935 Totals	213,806	192,699 (avg.)	90.13
1934	213,044	181,926 (avg.)	85.39

Increasing Imports Reduce Steel's Wages

MORE than 3900 American workmen have been deprived of full-time jobs during the first five months of 1935 as a result of increasing imports of foreign-made steel during that period, according to the records of imports and calculations made by the American Iron and Steel Institute and based on a recent report by the Department of Labor concerning the number of man-hours required to produce various classes of steel products.

The tonnage of steel imported during the first five months of this year was 65 per cent above the quantity imported during the corresponding period of 1934. Domestic production of steel during the same period of this year, however, was less than 3.5 per cent above the first five months of 1934.

A total of 73,836 tons of finished and semi-finished steel was imported into the United States in the first five months of 1935, as compared with 44,769 tons in the like period of last year. If those products imported this year had been made in this country instead of abroad, 3,445,245 hr. of employment would have been created for American workmen, which would have increased steel payrolls by $2,477,000 at the average rates of pay prevailing in the industry during the first five months of 1935.

Of these jobs lost to American workmen through the importation of foreign-made steel, about 2640 would have been available in the steel mills, according to calculations based on the Department of Labor figures, while mining the ore, coal and limestone necessary to produce the steel in this country would have employed 570 more men.

Another 590 men would have been required to transport by rail and water the 6 tons of raw materials entering into each ton of steel and finally to transport the finished steel itself to market. Manufacture of coke for use in blast furnaces would have given employment to 110 more men.

The Foundry Equipment Manufacturers' Association, 1213 West Third Street, Cleveland, has recommended that all members of the foundry equipment manufacturing industry maintain the working hours, payment of wage rates, including overtime rate, prohibition of child labor, and other labor provisions of the NRA code of the industry.

American Institute of Steel Construction Plans Board Membership Service

THE board of directors of American Institute of Steel Construction, Inc., at a meeting held June 26, approved and recommended to the Industry a plan for the collection by the Institute and the distribution to members of the Industry of statistical information with regard to the Industry, for the information and education of its members.

During the past five years the Industry as a whole has sustained exceptionally heavy losses. Being a capital goods industry, the demand for its products has declined during the period of depression relatively to a much larger extent than the demand for the products of other industries.

With the great decline in the amount of available work it has become increasingly important to the members of the Industry that they should have available complete and reliable information with regard to the costs of the products and services furnished by them, the extent of the demand therefor, the tonnages of such products sold by members of the Industry and the prices at which such products have been sold and such services rendered in past transactions. It appears that the lack of such information in the past has been one of the principal causes of the great losses incurred by the Industry as a whole during the past five years and that, therefore, the establishment of a system whereby such information shall be made available to members of the Industry is imperative.

It is provided in its constitution that the Institute shall not advise concerning, or discuss or interfere in the relations between employers and employees, or in any way deal with the fixing of prices, or foster or create, either directly or indirectly, any agreement, resolution or trade custom tending to a combination in restraint of trade. This task was not undertaken with the idea of proposing a plan which would approach the limits of legality, but rather with the idea of establishing a system for the collection and distribution among members of the Industry of complete and reliable information with regard to its business, the cost of its products and services and the demand therefor, such as will enable the members of the Industry to conduct their businesses more effectively and intelligently and will result in free and open competition among them.

In accordance with its informational program as planned, members of the Institute will supply such data to headquarters as will enable the distribution of reports and analyses covering the composite or average experience in the cost of fabricating and erecting structural steel. The material will be kept up-to-date by revision as frequently as needed. These reports will be based upon the formulae set forth for uniform cost accounting by the Institute in 1924.

There will also be prepared a form of report to be made by all members of the Industry for each six months' period commencing with the six months ending June 30, 1935, and covering the information as to tonnage of steel fabricated and tonnage of steel erected and as to costs above outlined.

The Institute will establish a Department of Statistics under a single responsible head openly and fairly to gather and disseminate information as to the costs of the products and services of the Industry, the volume of production and sales and the actual prices which the products and services of the Industry have brought in past transactions. The members of the Industry are requested to furnish to such department the following reports:

1. A monthly contract report setting forth in respect of each contract for the sale or erection of 50 tons or more of structural steel closed during the preceding month.

2. A monthly production report showing the total tonnage fabricated by the reporting concern, (a) during the preceding calendar month and (b) for the current calendar year to date.

3. A monthly shipment report showing the total tonnage shipped by the reporting concern, (a) during the preceding calendar month and (b) for the current calendar year to date.

4. A monthly erection report showing the total tonnage erected by the reporting concern, (a) during the preceding calendar month and (b) for the calendar year to date, and also the total tonnage the erection of which has been sublet to others (c) during the preceding calendar month and (d) for the current calendar year to date.

5. A monthly report showing the tonnage (a) available for fabrication within the four months following the preceding calendar month and (b) the total tonnage available for fabrication thereafter.

The department will tabulate and total the above reports and publish to the Industry and the public the following monthly reports:

1. Total contracts closed showing the total weight in tons both for the preceding calendar month and for the calendar year to date of tonnage sold for delivery and erection and delivery only and also tonnage taken for erection only.

2. Total production of tonnage fabricated (a) during the preceding calendar month and (b) for the calendar year to date.

3. Total shipments in tons (a) during the preceding calendar month and (b) for the calendar year to date.

4. (a) Total tonnage available for fabrication within the four months following the preceding calendar month and (b) the total tonnage available for fabrication thereafter.

Bid Depositary

The Institute will establish a single bid depositary under the direction and control of the director of statistics with which copies or summaries of bids made by members of the industry shall be deposited and which shall be conducted in strict compliance with the rules approved by the board of directors.

Will Sell Steel Works Directory

BY special arrangement with the American Iron and Steel Institute, THE IRON AGE is able to offer to its readers copies of the revised 1935 edition of the Iron and Steel Works Directory of the United States and Canada at the regular price to non-members of the institute of $10.

The new edition embodies a number of features not previously found in the directories. In addition to full details regarding plant capacities of all companies engaged in the steel industry, supplementary lists are included which show for each class of products the name of each maker and its rated capacity. Another list includes the names of all companies appearing in the 1930 edition of the directory which are not in the new one together with the reason for omission.

Copies of the directory may be obtained from the Reader Service Department of THE IRON AGE, 239 West Thirty-ninth Street, New York, at $10.

THIS WEEK IN WASHINGTON

Aug. 15 is now set as deadline for adjournment of Congress, although studied consideration of legislation before it would be impossible in that time.

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First hearings on proposed tax program become ludicrous because of lack of definite program.

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Higher levies on large corporations completely disregard invested capital and also rights of millions of shareholders.

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President's message urging passage of Guffey bill despite constitutionality is considered direct challenge to Supreme Court.

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Transfer of Dr. John Dickinson to Department of Justice is welcomed by business interests.

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BY L. W. MOFFETT

Resident Washington Editor, The Iron Age

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WASHINGTON, July 16.—The heat and humidity of Washington must account for its increasing bleat and stupidity. . . . For if it is possible to raise the ratio in that direction, it is being done. . . . Hot words become hotter. Panaceas in the name of recovery become panicky. . . . The old Ananias club instituted under Roosevelt the First loses all semblance of exclusiveness as charges of "liar" are bandied back and forth under the regime of Roosevelt the Second. . . . They take in members both from within and from without the Administration, running from the top down. . . .

Congress, lashed to its sweltering job that produces more swelter than worth-while work, is told to wrestle its way through "must" legislation. . . . But it hopes now to close up and give a baffled country a rest by Aug. 15, unless it stages a real revolt and gets away sooner. . . . Yet considering the magnitude and character of the "must" legislation, it could not nearly clean it up if given studied consideration by the date indicated. . . .

It is difficult to say what may be the outcome of the growing rebellion among members of the Administration's party in Congress. . . . It gives the aspect of real force at times. . . . Then, the Administration, seeming to lose the reins as criticisms are heaped on it, stages a recovery. . . . But it is only a political recovery, not an economic one, which it appears to be making in the haggling over the "death sentence" in the holding-company legislation, in TVA and in its soak-the-rich campaign, and as it may do in connection with the Guffey coal nationalization bill. . . .

But the tearing process of the New Deal "program" is inevitably to continue. . . . If not in Congress, in the courts. . . . Unfortunately, however, the courts may not be reached until after the Presidential campaign is over. . . . After that it would make much less difference to the politically minded. . . . This situation of turmoil, confusion, bitterness, arraying of class against class when the nation in all its history never was more greatly in need of statesmanship with clarity of purpose, cooperation of all classes and real hard work in a peaceful atmosphere goes on unabated. . . . Intolerance of criticism cannot be justified by intemperate charges of "ulterior motives" or retorts that they are "criticisms of negation." . . . Which is not to say that there are politics evident on both sides. . . . It all bodes no good for a bewildered country which is infinitely more interested in recovery than in partisan bunk and sophistry. . . .

John Q. Public would not squirm in the least if the "death sentence" were passed upon the holding companies which have milked the aforesaid John Q. Public. . . . But why burn the barn to kill a few rats? . . . and no matter how well power companies have served and in spite of what they have contributed to

the Federal Treasury in the way of taxes, so badly needed in these days of a huge spending spree, it is proposed that TVA compete with them on a basis of unfair competition that ought to make the Blue Eagle rise from its grave and scream. . . .

Witnesses protesting against the soak-the-rich tax program are curtly dismissed as it becomes clear that the Administration is determined to proceed with its original narrow program to lay levies upon the wealthy, though there was a hopeful indication in a passing moment that the base would be broadened. . . . The hearings were decidedly of an ex-parte nature, yet might have escaped their ludicrous character had some of the witnesses reflecting the side of business and industry used more temperate language. . . . Secretary of the Treasury Morgenthau, with his formidable 29 schedules for taxes only on high individual incomes, corporate incomes, inheritances and gifts, could give only rough estimates, extremely rough and wide, from $118,000,000 to $900,000,000, as to what they would do in the way of sweetening the sour Federal kitty.

The outgo in the past year, according to Senator Vandenburg, was at the rate of $13,812 per minute! . . . Governmental expenditures in excess of $14,000,000,000 in the past two years and receipts of less than $7,000,000,000! . . . Two dollars going out for each dollar coming in. . . . Offering even $901,000,000 against that situation is pitiful indeed. . . . And it is a question if the minimum estimate would be realized. . . . Taking the bigness out of business by taxation won't work when there is no or little net income to take it out of, and when, as is well known, the method would be attacked in the courts as unconstitutional, on the grounds that taxes can be levied for revenue only. . . .

Yet, as railroad witnesses pointed out, the inconsistency of the Administration was revealed when they directed attention to the fact that the Administration is urging railroad consolidations. . . . In order, it is assumed, that the groaning carriers will have to groan more under higher corporate taxes, while small business would get a reduction to 10 per cent. . . . The latter figure would apply to concerns with net incomes of $2,000 and less and the maximum level of 17½ per cent applying to corporations with net incomes of over $20,000,000. . . . And how many would that be? . . . A very few indeed! . . . Just as there were only 46 individuals filing returns last year whose income was over $1,000,000, and of this number only 26 had incomes which were appreciably beyond that figure. . . .

The corporate graduated tax plan gives no heed to return on investment. . . . It strikes only at the mere amount of income and disregards capital invested. . . . The stockholder in the large concern thus is discriminated against in favor of the stockholder in the smaller company. . . . The large corporation dividend might easily and often would be less per share than would be the dividend of the smaller concern. . . . The Wilson Administration during the war was more logical. . . . It applied graduated taxes to profits in excess of a stated per cent of investment. . . . Apparently it was not desired to take the bigness out of business, yet no one will say Woodrow Wilson was influenced by the "vested" interests. . . .

The high inheritance taxes, ranging up to 75 per cent on legacies of $10,000,000, would strike extremely hard, so hard indeed as perhaps to put out of business some of the family-owned industrial establishments. . . . The Ford Motor Co. is such a concern and there are examples in the steel industry. . . . But the present tax program, be what it may, and whether enacted in its existing form or not, is only a starter and if it is brought out clear on the political hustings during the political campaign, now getting under full steam, it will be a service to the country. . . . And it will be disillusioning. . . . For in the absence of wild inflation or outright debt repudiation, the base is going to be broadened aplenty and the little fellow will find that the tender solicitude being shown him is only a matter of temporary political expediency. . . .

". . . Business journals are emphasizing the view that Congress is no longer the nation's lawmaker," says the American Federation of Labor in its Monthly Survey of Business. "Acts of Congress do not become law until they have the Supreme Court's stamp of approval. Leading industrialists have announced they intend to ignore the Wagner Labor Disputes Act, to bring a court test. Business is losing much of its apprehension over the so-called reform legislation."

It's hot in Washington. . . . That may account for this distorted effort. . . . To say business journals are emphasizing that Congress is no longer the nation's lawmaker is moonshine. . . . But if business journals, the daily press, the man in the street or anyone else accurately reflects the situation in Washington, a simple recital of facts shows quite clearly that Congress, on all important legislation, with some notable exceptions, has been only a rubber stamp for the Administration. . . .

Potentially and actually, Congress is the law-making body of the Government and the laws are made prior to Supreme Court approval. . . . Which fundamental is stated in case the antics at Washington have created doubt and confusion. . . . But while the mechanics of lawmaking rest with Congress, it has certainly been told definitely what laws to make, told by the Administration, with the substantial aid of the American Federation of Labor. . . .

The Supreme Court, for which the nation is most grateful, frequently knocks some of this dictated legislation into a cocked hat. . . . Just as it has very properly nullified legislation which was opposed by organized labor. . . . Leading industrialists will ignore the Wagner act? . . . Quite the contrary, they are keen to recognize it and anxiously await opportunity to test it in the courts, which is assuredly their right. . . . If the act is constitutional, which the vast bulk of legal authority says it is not, why would not the A. F. of L. welcome the test? . . . And if it is unconstitutional, can it be that the A. F. of L. would not want to see it repealed? . . . Or does the A. F. of L., more or less secretly, also have the "horse-and-buggy" opinion of the Supreme Court? . . . If so, it might join with those holding a like view and take the issue to the country. . . . And what a wreckage will be left in the wake! . . .

Where is there a better example of Administration-dictated legislation than the amazing demand made by the President on a reluctant House for enactment of the Guffey coal nationalization bill? . . . It is a bill frantically pressed by organized labor, combined with a large group of coal operators in the North, and bitterly opposed by Southern operators. . . . In a letter to Representative Hill, of the Ways and Means Committee, the President urged speedy action on this measure and expressed the hope that "your committee will not permit doubts as to constitutionality, however reasonable, to block the suggested legislation."

If this position, especially when taken in connection with White House resentment at the Schechter decision, is not an implied challenge to the Supreme Court to go the limit and accept the consequences, what can it be rightfully called? . . . As if public opinion would turn upon the Supreme

Court! Hardly can it be said that the purpose is simply the desire that "a decision by the Supreme Court relative to this (Guffey bill) measure would be helpful as indicating with increasing clarity, the constitutional limits within which this Government must operate." . . . Not when it is the almost unanimous opinion of the legal profession that the bill is unconstitutional. For one thing it proposes a tax as a penalty to restrain price cutting and not for revenue. . . . Moreover, the Department of Justice itself is reported to have prepared an opinion that the bill is unconstitutional.

The President, however, says there are a "thousand different legal views." . . . His own Attorney General declined to pass on the constitutionality of the bill when called before the Ways and Means Committee. . . . This shows that Mr. Cummings has his doubts, if not unexpressed convictions. . . . It will be interesting if the Attorney General responds to the resolution of Senator Byrd of Virginia calling for an opinion. . . .

Dickinson to Department of Justice

Transfer of John Dickinson from the position of Assistant Secretary of Commerce to that of Assistant Attorney General in charge of the anti-trust division, made at the request of Attorney General Homer S. Cummings, has met with favorable response at the hands of business. Radical advisers in the Administration, on the other hand, are displeased and are understood to feel that the President has made an "undue concession" to business in placing Dr. Dickinson at the head of the trust-busting section of the Government. Although he is strictly known as a New Dealer, the "liberal" element in the Administration considers him too conservative, and points particularly to the fact that he did not approve of the securities exchange act.

Former professor of economics in the University of Pennsylvania, and known as an able lawyer, with both a broad economic and legal background, Dr. Dickinson was highly regarded by business as Assistant Secretary of Commerce. He is said to be opposed to too literal enforcement of the anti-trust laws because of the bad effect it would have on business. He has frequently expressed views on so-called monopolistic and fair trade practices which are held by business generally to be sound.

His activities as head of the anti-trust division promise to be especially important now that NRA no longer has control over business and the question of monopolistic practices will require careful attention in view of the anti-trust amendment carried in the revised National Industrial Recovery Act. Voluntary agreements are barred from violating the anti-trust laws and, in promulgating them, the Federal Trade Commission will cooperate with Dr. Dickinson on this phase of the agreements. Dr. Dickinson succeeds Harold M. Stevens, resigned.

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Committee Studies Advisory Council Future

Following dissension in the Business Advisory Council of the Department of Commerce, resulting in the resignation of five members, a committee has been set up to study its future. The organization is made up of some 40 business men and industrialists and was set to advise the Administration on business problems. Disregard of its opinions and recommendations is said to have created widespread dissatisfaction and the subsequent resignations.

H. P. Kendall, chairman of the council, in denying that the council was about to disband, issued a statement after a meeting last Thursday, in which he said that it is possible that future activities may be greatly changed or curtailed. The vacancies in the council were not filled. Nor was a chairman named to succeed Mr. Kendall whose term has expired.

Mr. Kendall said he felt that the council has never been in a better position to carry on the "great work for which it was organized than at the present time." He stated that the program and planning committee just named will carry on its efforts during the remainder of the summer and that some time during September the members of the council will meet again to continue their efforts.

"One of the plans suggested for the future of the council," he said, "was that the members be elected for a three-year period, with one-third of the membership rotating yearly."

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Railroad Credit Corpn. Continues Liquidation

The Railroad Credit Corpn. will, on July 31, make its nineteenth liquidating distribution equivalent to 1 per cent of the contributed fund. This distribution will repay $735,885, of which $379,858 will be in cash and $356,027 in credits on obligations due the corporation. The total returned by the corporation to participating carriers will then amount to $25,020,094, or 34 per cent, of which $11,285,395 will have been paid in cash and $13,734,699 in credits.

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Big Allotment Asked for Army

Applications have been made by the Quartermaster General of the Army for public works relief allotments for 60 projects, involving $20,926,740, in 14 States. The projects generally cover new buildings and improvements at forts and arsenals.

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Lets Down Bars to Foreign Materials

In adopting for non-Federal projects the statute regulation requiring that Federal projects be made of domestic materials unless the cost is unreasonable, the Public Works Administration has defined "reasonableness" as warranting the following maximum differentials in favor of domestic articles:

On purchases where the foreign bid is $100 or less, a differential of 100 per cent will apply.

On purchases where the foreign bid exceeds $100, but is less than $10,000, a differential of 25 per cent will apply.

On purchases where the foreign bid is $10,000 or more, a differential of 15 per cent will apply.

If domestic prices exceed the approved differential it is mandatory that foreign material be purchased if the purchaser is the borrower. Purchase of foreign material is optional if the buyer is a contractor.

The mandatory feature of the regulation is regarded as open to objection because a 15 per cent margin on large purchases, especially of steel, may not be enough to prevent the purchase of foreign material which would not be otherwise considered owing to deliveries and other factors not reflected in the price.

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Slum Clearance Program To Be Continued

A decision of the United States Circuit Court of Appeals at Cincinnati, in the so-called Louisville case, holding that the United States does not have the power to condemn land for slum clearance, will not halt the Government's low-rent housing program, according to a statement issued by Harold L. Ickes, Public Works Administrator.

Two general methods can be employed without overstepping the ruling of the court. One is to cooperate with municipal or State authorities to permit local condemnation proceedings and the other is to make direct purchases of land

by negotiation and without condemnation.

Slum clearance projects are now under construction at Atlanta and Cleveland, and a total of 40 are approaching the point where bids can be asked and contracts placed.

"While lack of authority to institute condemnation proceedings will restrict the slum clearance and low-rent housing program somewhat," Secretary Ickes said, "it will not shut it off. We have laid the groundwork for proceeding without condemnation, and in a good many cities we have already selected alternate vacant land sites, where ownership is confined to one or to a few persons."

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Works Allocations Approved by President

The President has approved allotments totaling $48,265,258 to be used for non-Federal projects in carrying out the works program under the Emergency Relief Appropriation act of 1935. Distribution is as follows: City of New York, 13 projects, $13,975,756; state of Georgia, 529 projects, $3,747,389; state of Indiana, 785 projects, $25,036,488, and state of Alabama, 130 projects, $5,505,625.

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170 Industries Apply for F.T.C. Agreements

More than 170 industries have entered into negotiations with the Federal Trade Commission with reference to the setting up of trade agreements or the holding of trade practice conferences. Of these, approximately 100 industries have got into touch directly with the commission. In addition, the NRA has turned over to the commission about 20 suggested voluntary codes and correspondence files of more than 50 other industries which had indicated to the NRA their interest in entering trade agreements.

The commission expects to hold trade practice conferences preliminary to setting up trade agreements beginning about Aug. 1. The identity of the industries evincing an interest in agreements has not been divulged. Fair trade practices under the trade agreements will fall into two classes—one covering practices definitely outlawed by statute, and the other embracing practices not of themselves unlawful, but which members of an industry agree to banish. Industries may agree to guarantee minimum wages, maximum hours and to the abolition of minimum wages, maximum hours and of child labor, but such a commitment will be entirely voluntary, falling in the second class.

Rules Governing Road and Grade Separation Programs Announced

WASHINGTON, July 16. — Rules and regulations governing the expenditure of $400,000,000 in Federal funds for road construction and for grade separation have been announced by the Bureau of Public Roads, Department of Agriculture.

All projects must originate with State highway departments and, after submission by the district engineer of the roads bureau to the State administrator of the Works Progress Administration and the State director of the National Emergency Council for their concurrence, must be passed upon by the bureau at Washington.

The total cost of a project may not exceed $1,400 per man-year of direct employment. There are exceptions to this rule, however. In the case of both grade crossing work and highways a State may propose an alternate plan under which it will guarantee to take from relief rolls and give employment for a year to its full quota of individuals, determined by dividing the grade crossing allotment by the allowable expenditure of $1,400 per man-year of employment. This may involve the use of State funds to the extent necessary in excess of Federal funds allotted the State. In the case of grade separation projects there is another alternate plan, under which 40 per cent of the total cost, including costs of private property, must go to persons directly employed on the project.

It is stipulated that 90 per cent of all workers on these projects must be taken from relief rolls.

The apportionment of funds is evenly divided between highway construction and grade separation, each being allotted $200,000,000.

Commercial Drop Forgers Organize

COMMERCIAL drop forgers have formed a new organization under the name of the Drop Forging Association. It succeeds the American Drop Forge Institute, which represented the industry before the code authority that functioned under the NRA.

Officers of the new association are: President, A. J. Sanford, vice-president and general manager, Cleveland Hardware & Forging Co., Cleveland; vice-president, M. R. Carrier, Federal Drop Forge Co., Lansing, Mich., and secretary and treasurer, R. M. Seabury, formerly affiliated with the drop forging industry and later connected with the industry's code authority.

The board of directors consists of the president and vice-president and A. M. Cornell, Cornell Forge Co., Chicago; W. J. Dean, Cape Ann Tool Co., Pigeon Cove, Mass., and Edwin Hodge, Jr., Pittsburgh Forging Co., Pittsburgh.

A membership of 39 representing approximately 70 per cent of the capacity of the drop forging industry has already been enrolled in the organization. Headquarters have been established at 605 Hanna Building, Cleveland.

Will Undertake Study Of Steel Industry

WASHINGTON, July 16.—A factual survey of the iron and steel industry prior to, during and after the code has been undertaken by R. W. Shannon, Deputy Administrator, NRA, with the cooperation of a staff now being selected. Subjects to be covered in the study include labor relations, employment and unemployment, wages, competition, and price structures especially as they relate to the basing point system.

The survey staff will include a representative of the labor section of the NRA division of review, an economist, representatives of the legal section, a representative of the statistical section and others whose training in NRA qualifies them to contribute to the consummation of a coordinated and well-rounded study.

Dr. M. P. Sharp, of the University of Chicago, who was a member of the committee on basing point study, will be a member of the committee, and Prof. J. M. Clark, of Columbia University, who is president of the American Economic Association and was also a member of the NRA committee on basing point study, will be consulted. Other authorities, not only in academic, but also in technical and industrial fields, will be called upon for counsel.

The study is in no sense an attempt to justify the course pursued under code control, but is rather intended to develop not only facts but a perspective of value to the public and to the steel industry itself. With this end in view, the cooperation of the industry is asked for.

Fabricated Structural Steel

Awards in Smaller Volume—New Projects Lower

LETTINGS of 17,000 tons compare with 21,800 tons last week. The largest bookings are 3200 tons for the approach to the Midtown-Hudson tunnel in New York, 1825 tons for a mill building at Middletown, Ohio, for the American Rolling Mill Co., and 1700 tons for the Acacia Life Insurance building at Washington. New projects of 9700 tons compare with 19,500 tons in the previous week and 9000 tons two weeks ago. New inquiries of size include 1700 tons for a dam at Genoa, Wis., 1350 tons for a depressed roadway for an approach to the Triborough bridge in New York, and 1000 tons for a concentration plant at Kimberly, Nev. Among plate lettings of 6225 tons is 5625 tons for a pipe line at Fort Smith, Ark. Structural steel awards for the week follow:

STRUCTURAL AWARDS

NORTH ATLANTIC STATES

Worcester, Mass., 465 tons, ward and surgical building, to Ingalls Iron Works Co.

Quincy, Mass., 170 tons, high school, to West End Iron Works.

New York, 3200 tons, approach to Midtown-Hudson tunnel, to McClintic-Marshall Corpn.

New York, 1150 tons, store and theater building at 1514 Broadway, to Ingalls Iron Works Co.

New Dorp, Staten Island, 1100 tons, high school, to Bethlehem Fabricators, Inc.

Port Richmond, N. Y., 690 tons, Staten Island Rapid Transit grade crossing elimination, to Shoemaker Bridge Co.

Borough of Richmond, N. Y., 1085 tons, high school building, to Bethlehem Fabricators, Inc.

Philadelphia, 100 tons, office building for Beneficial Loan Society, to Reading Steel Products Co.

Erie, Pa., 425 tons, mill building, to Pittsburgh DeMoines Steel Co. and Levison Steel Co. jointly.

Pittsburgh, 220 tons, John Conroy school, to McClintic-Marshall Corpn.

Meadville, Pa., 800 tons, building for Viscose Co., to McClintic-Marshall Corpn.

Washington, 1700 tons, Acacia Life Insurance Co. building, to McClintic-Marshall Corpn.

Baltimore, 225 tons, building for Gunther Brewing Co., to Reading Steel Products Co.

THE SOUTH

Athens, Ga., 675 tons, bridge, to Virginia Bridge & Iron Co.

CENTRAL STATES

Saginaw, Mich., 1000 tons, forge and bumper shop, Chevrolet Motor Co., to McClintic-Marshall Corpn.

Detroit, 105 tons, addition to Chevrolet forge shop, to Palmer-Bee Co.

Detroit, 240 tons, parcel post building, to Hansell-Elcock Foundry Co.

East Liverpool, Ohio, 255 tons, building for Hall China Co., to McClintic-Marshall Corpn.

Middletown, Ohio, 1825 tons, mill building for American Rolling Mill Co., to Ingalls Iron Works Co.

Fort Dodge, Iowa, 600 tons, viaduct, to Wisconsin Bridge & Iron Co.

Chicago, 300 tons, Intaglio building, to an unnamed bidder.

Wichita County, Kan., 375 tons, bridge, to Austin Brothers Bridge Co.

WESTERN STATES

Walla Walla, Wash., 140 tons, building for Pacific Telephone & Telegraph Co., to Pacific Car & Foundry Co.

Eureka, Cal., 100 tons, Mad River dam, to an unnamed bidder.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Boston, 150 tons, Washington Irving school repairs.

New York, 1350 tons, depressed roadway approach to Triborough bridge.

Brooklyn, 160 tons, Kings County Hospital addition.

Pittsburgh, 500 tons, Knoxville junior high school.

Wilmington, Del., 500 tons, post office.

SOUTH AND SOUTHWEST

State of Kentucky, 206 tons, Elliott County bridge; Lackawanna Steel Construction Co. low bidder.

Charleston, S. C., 250 tons, cranes.

Woodbury, Ga., 200 tons, State highway bridge.

Tempe, Ariz., 260 tons, buildings for Arizona Teachers' College; bids opened.

CENTRAL STATES

Genoa, Wis., 1700 tons, dam No. 8.

Clinton, Iowa, 935 tons, lock No. 13 in Mississippi River.

Osborn County, Kan., 200 tons, highway bridge; bids July 19.

Zanesville, Ohio, 2100 tons, 11 railroad bridges for relocation of lines in Muskingum Valley Conservancy district; Mt. Vernon Bridge Co. low bidder.

Zanesville, 170 tons, one-half reinforcing bars, for relocation of Baltimore & Ohio tracks at Bolivar; Elmer Vogt Paving Co., Massillon, Ohio, low bidder.

Zanesville, 150 tons, structural and miscellaneous steel for relocation of Pennsylvania Railroad tracks at Wills Creek; Edward Peterson Co., Omaha, low bidder.

WESTERN STATES

Riggins, Idaho, 260 tons, State bridge over Salmon River; bids opened.

Kimberly, Nev., 1000 tons, concentration plant; plans being prepared.

Pittsburg, Cal., 100 tons, school; bids opened.

Los Angeles, 545 tons, tunnels and pipe line on Colorado River project between Sierra Madre and Pasadena; Specification 110; bids July 30.

Los Angeles, 105 tons, Cajalco dam, dike and tunnels near Riverside, Specification 112; bids advanced to Aug. 12.

Alhambra, Cal., 150 tons, post office; bids July 23.

Seattle, 550 tons, Knick River bridge for Alaska Road Commission; bids July 25.

Seattle, 100 tons, two hoists for Landsburg dam on Cedar River; Puget Sound Machinery Depot low bidder.

Bonneville Dam, Ore., 253 tons, gantry cranes for power house; Star Iron & Steel Co. low bidder.

Bonneville Dam, Ore., 637 tons, intake gates for power house; Pacific Car & Foundry Co. low bidder.

Bonneville Dam, Ore., 5000 tons, gantry cranes and main gates; Columbia Steel Co. is low bidder.

Anchorage, Alaska, 550 tons, bridge.

FABRICATED PLATES

AWARDS

Philadelphia, 100 tons, 40 pontoon tanks for Standard Dredging Co., to Paterson Boiler & Tank Co.

Fort Smith, Ark., 5625 tons, pipe line, to Taylor Pipe & Forge Co.

Los Angeles, 100 tons, tanks for Seaside Oil Co., to Southwest Welding Co.

Los Angeles, 100 tons, tunnel lining for Department of Water and Power, to Western Pipe & Steel Co.

Sante Fe Springs, Cal., 300 tons, pipe line for Wilshire Oil Co., to Southwest Engineering Co.

SHEET PILING

NEW PROJECTS

Los Angeles, 810 tons, Cajalco dam, dike and tunnels near Riverside, Specification No. 112; bids advanced to Aug. 12.

NEW PROJECTS

Genoa, Wis., 149,000 sq. ft., dam No. 8; bids Aug. 20 at St. Paul, Minn.

Michigan City, Ind., 1500 tons, bulkhead wall. Bids taken.

Dearborn, Mich., 400 tons for Ford Motor Co.

Machine Tool Index Highest Since 1930

MACHINE tool orders during June were the best since April, 1930. The index of the National Machine Tool Builders' Association reached 91.1, exceeding the 15-year average for the first time since 1930. In the preceding month, the index was at 73.3, compared with only 35.3 in June, 1934. Foreign orders accounted for only about 17 per cent of the June, 1935, total.

The association points out, however, that not all of the increase in business last month can be translated into units of machines on the same basis as new business placed earlier in the year. "Advancing costs," according to the report, "have brought about a number of belated adjustments to changed conditions, and prices of machine tools have been increased from 2 or 3 to 15 per cent above former lists. Making allowances for all such price changes, however, there remains unmistakable evidence of growing expansion in machine tool demand."

Metal-Working Industry May Benefit from Soviet Pact

A TRADE agreement between the United States and Russia concluded at Moscow, July 13, may result in increased exports of steel and machinery to the Soviet Union. The Soviet Government has given assurances that it intends to purchase American goods this year to the value of $30,000,000. This represents an increase of more than 100 per cent over our exports to Russia last year, which totaled $14,831,781, according to figures supplied by the Department of Commerce.

On its part the United States has extended to the Soviet Union the tariff concessions granted under the trade agreements with Belgium, Haiti and Sweden and has agreed to extend the benefits of tariff concessions made to other countries during the life of the Russo-American pact, which is to be one year. The trade agreement with Cuba is specifically excepted from this commitment. On the other hand, the agreement with Brazil, now awaiting approval by that country, would apply. The pending pact with the South American country provides for a 50 per cent reduction in duty on manganese ore, of which the Soviet Union is a large exporter.

Critics of the Soviet-American pact declare that Russia had forecast purchases of $30,000,000 worth of American goods this year as early as January and that orders placed to date have been at a rate indicating buying of that magniture. They declare that this country gained nothing that it would not have had anyhow and granted real concessions in return. The agreement, however, at least puts the Soviet Union on record as officially committing itself to what had previously been vague estimates.

Exports to Russia Gain

Iron and steel exports to Russia to date this year have shown a marked gain over 1934. In the five months, January to May, they totaled 16,862 tons as against 1799 tons in the corresponding period last year. The breakdown for the principal products is shown in table.

Imports of pig iron from Soviet Russia this year totaled 2483 tons, all of which was shipped in during the month of May. In the first five months of 1934 there were no imports of Russian pig iron.

Imports of manganese concentrates from Russia in the first five months of this year totaled 43,701 gross tons, while iron ore shipments were 24,540 tons. There were no imports of manganese ore.

Imports by months are given in the table.

ORE IMPORTS FROM SOVIET RUSSIA IN 1935
(In Gross Tons)

	Manganese Concentrates (35 Per Cent Plus)	Iron Ore
January	6,564	8,150
February	10,749	....
March	10,256	7,090
April	7,259	9,300
May	8,873	....
	43,701	24,540

Exports of industrial machinery to Russia vary widely from month to month, but records since last June do not indicate that there has been a marked upward tendency so far this year.

AMERICAN EXPORTS OF INDUSTRIAL MACHINERY TO RUSSIA

1934	
June	$589,070
July	606,047
August	340,977
September	77,939
October	152,998
November	298,123
December	78,685
1935	
January	$99,689
February	219,749
March	520,773
April	339,116

Among those who have watched Russo-American trade, there is a feeling that the Russians have outsmarted American sellers, extorting prices and terms from them that were not justified by competitive conditions. A review of leading products imported from us by Soviet Russia last year suggests that the Soviet Union is concentrating its purchases on products which it cannot make itself or which it cannot obtain in as good quality elsewhere.

A leading item last year was oil well and refining machinery, amounting to $433,580. Expenditures on this class of equipment are becoming more and more imperative as the market for Russian petroleum products expands. Last year Russia had to buy foreign oil to fill its export commitments. Only recently it placed a contract with Alco Products, Inc., New York, for $1,175,000 worth of oil refining equipment for use in a new Russian field near Ufa on the west slope of the Ural Mountains.

Russia continues to buy machine tools which, in the absence of a patent convention with this country, it laboriously attempts to copy in its own shops. However, it is coming to be recognized that in the higher quality tools its efforts to reproduce American design and American skill have been largely unsuccessful.

Russia as a Machine Tool Buyer

Among machine tool imports from the United States last year were the following: Lathes, $545,664; vertical boring mills and chucking machines, $64,753; thread-cutting and automatic screw machines, $84,843; milling machines, $255,155; gear-cutting machines, $304,530; drilling machines, $198,922; planers and shapers, $44,438; metal-grinding machines, $757,136; sheet and plate metal-working machines, $132,433; forging machinery, $34,482; foundry and molding equipment, $45,664; other power-driven metal-working machinery and parts, $245,998.

Russian imports in 1934 of American automobiles, buses, trailers, chassis and parts totaled $1,207,690. Soviet imports of American aircraft parts and accessories amounted to $3,276,490.

The Soviet Union continues to import American rolling mill equipment. A $3,000,000 contract placed by Amtorg Trading Corpn. with United Engineering & Foundry Co., Pittsburgh, this spring, calls for the erection of a continuous mill at Zaporojstal, having an annual capacity of 600,000 metric tons of hot and cold-rolled strip up to 60 in. wide.

A press report from Moscow intimates that Russia will buy railroad equipment in Europe rather than in the United States. This is regarded as an "inspired" story designed to whet the appetite of American builders. As a matter of fact the only foreign order for rolling stock or rolling stock parts that has been placed by Russia for many months was a recent purchase of wheels and trucks in Great Britain. It is a matter of common knowledge that the Soviet Union is badly in need of new equipment.

EXPORTS TO SOVIET RUSSIA IN 1935
(In Gross Tons)

	January	February	March	April	May
Black sheets	3,494	....	....	....	871
Cold-rolled strip steel	25	....	505	22	....
Tin plate and taggers' tin	1,603	....	745	5	....
Wire nails	1	....	....	....	....
Carwheels and axles	....	....	7,181	....	....
Black steel welded pipe	....	....	143	....	....
Seamless boiler tubes	....	....	20	412	....
Alloy steel bars	....	....	1	....	....
Steel bars	....	....	....	....	767
	5,123	....	8,595	439	1,638

▲▲▲ Sharp Recovery in

OPERATIONS in the heavy industries revived last week as expected after the holiday interruption, but the recovery from 50.7 to 53.9 was not sufficient to restore THE IRON AGE Index to its June average. Among the components of the index, steel ingot output, after seasonal correction, came back to the level of the week ending June 29. Automobile production also returned to approximately the June level. Heavy contract awards in dollars fell beneath the total for the preceding holiday week, and the construction component now stands only fractionally above the year's low reached in the first week of May. The indexes for lumber and Pittsburgh district activity, which declined sharply during the holiday week, it is estimated, have recovered most of the ground lost.

The Iron Age Weekly Index Numbers of Capital Goods Activity

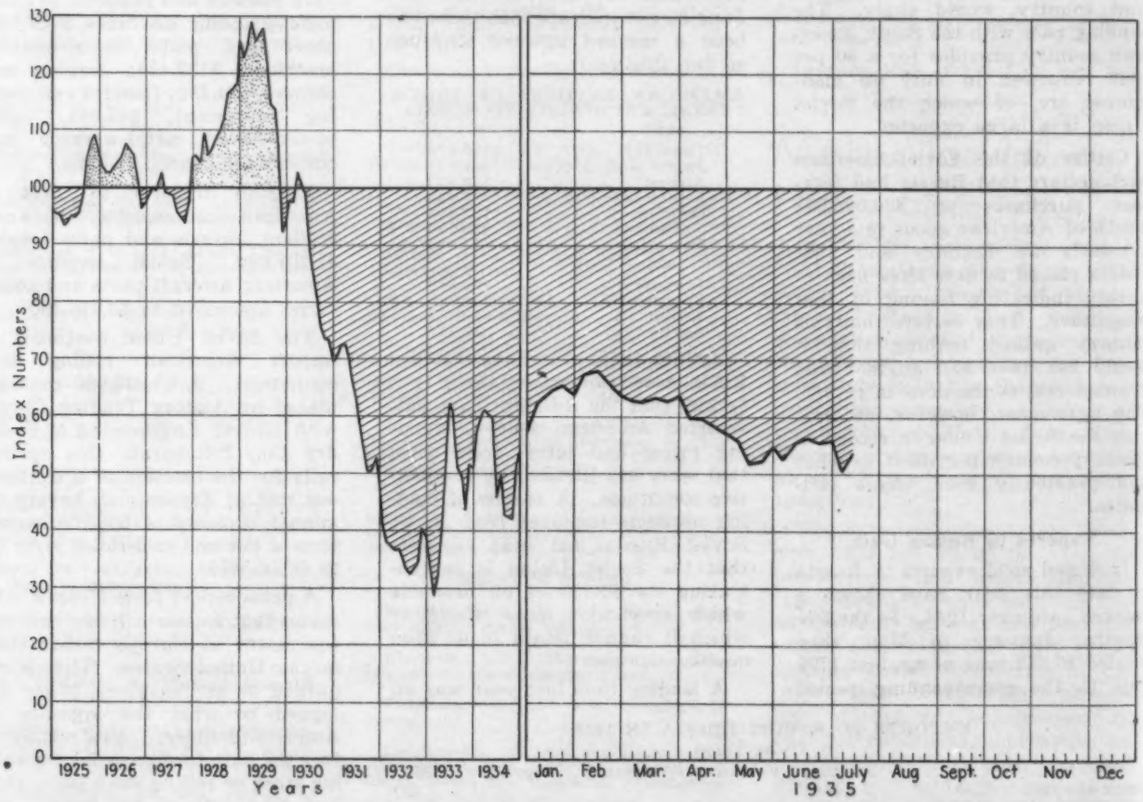
(1925-27 Average = 100)

Last week (est.)	53.9
Preceding week (rev.)	50.7
Same week last month	55.2
Same week 1934	48.6
Same week 1933	62.9
Same week 1932	35.6
Same week 1931	62.5
Same week 1930	94.6
Same week 1929	128.7

THE IRON AGE Index for last week is 10 per cent above that of the same week of 1934 and shows a greater than 50 per cent recovery over the depressed 1932 figure of 35.6. At the present level, however, it is nearly 15 per cent below the indexes for the corresponding weeks in 1931 and 1933.

Corporation Tax Proposals

President Roosevelt's recent surprise message to Congress proposed that corporation income taxes be graduated in accordance with the total amount of net income, and the Treasury has since computed yields at schedules of rates varying from 10 per cent on corporate incomes of less than



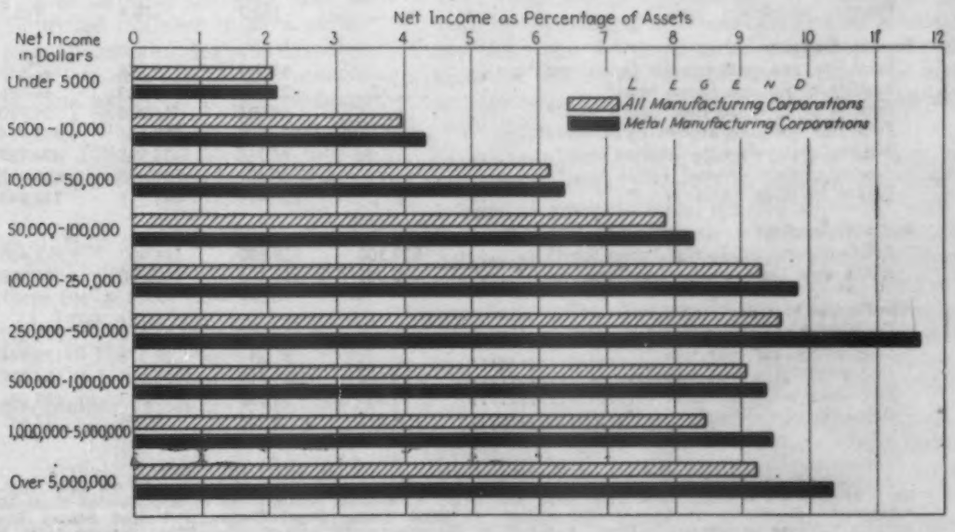
The Iron Age Index of Capital Goods Activity. The years 1925 to 1934 are plotted by months, the current year by weeks.

The Iron Age Index ▲▲▲

$2,000 to 17½ per cent on the largest incomes. This revolutionary proposal has been advanced on the theory, apparently, that large corporations, irrespective of the nature of the industry in which they operate or the rate of earnings on their invested capital, possess advantages which enable them to operate more profitably than small ones. This new policy is of vital significance to large corporations in all lines of business, but particularly to iron and steel and other heavy industries whose technology is such that heavy capital investment and large-scale operations are inevitable. If this corporate tax program is adopted it will mean not only that large corporations in every line of business will be compelled to operate at a disadvantage, but that entire industries engaged in the manufacture of capital and durable goods, and therefore requiring large capital investment, will be placed under a serious additional handicap in their struggle to recover from the depression. Thus the effect of the tax will be to stimulate the expansion of such industries as baking, confectionery and millinery where small-scale operations are usual and to discourage enterprise in such industries as automobiles, steel and cement, where small-scale operations are impossible.

Moreover, there is little evidence to support the assumption that the *rate* of earnings on invested capital in the largest corporations is higher than, or even as high as, the rate in those of smaller size. Unfortunately, no recent data are available to test this theory, but Treasury statistics for the prosperous year 1926 presented by Professor W. L. Crum of Harvard University in "Corporate Earning Power" are of interest in this connection. The chart at the bottom of the page, which is based on this study, shows the ratio of net income to estimated total assets of corporations in various income classes. It is apparent that, except for the smallest corporations with net income of less than $100,000, there is no tendency for the rate of earnings to increase with the amount of net income. Thus the highest ratio of net income to total assets, both in the case of all corporations and those engaged in metal manufacturing, was shown by corporations having net incomes between $250,000 and $500,000. Indeed, even the smaller corporations, with incomes of $100,000 to $250,000, experienced a distinctly higher rate of return on their assets than the group of much larger organizations having total incomes of $1,000,000 to $5,000,000. Yet the Treasury schedule proposes a tax of 15 per cent on corporate incomes between $100,000 and $300,000, as compared with 17 per cent on incomes of over $1,000,000.

The low rate of return shown on the chart for the very small corporations is due partly to the fact that this group undoubtedly contains a larger proportion of the less efficient and less successful marginal firms. What is of greater significance, however, is the probability that the rate of earnings reported by these companies is fictitiously low because most of them are family corporations in which a relatively large proportion of their actual earnings is paid to their owners in the form of salaries, leaving a smaller proportion to be reported as net income.



RATIO OF CORPORATE NET INCOME TO TOTAL ASSETS

Source: *Corporate Earning Power* by William L. Crum, Stanford University Press.

Current Metal Working Activity Statistically Shown

These Data Are Assembled By THE IRON AGE from Recognized Sources And Are Changed Regularly As More Recent Figures Are Made Available. Boldface Type Indicates Changes This Week

	June, 1935	May, 1935	June, 1934	First Half, 1934	First Half 1935
Raw Materials:					
Lake ore consumption (gross tons)[a]	**2,198,757**	2,466,585	2,721,449	13,723,119	14,341,513
Coke production (net tons)[b]	.....	2,850,236	3,049,700	17,589,203	.....
Pig Iron:					
Pig iron output—monthly (gross tons)[c]	1,552,514	1,727,095	1,930,133	9,798,313	9,799,000
Pig iron output—daily (gross tons)[c]	54,138	55,713	64,388	54,134	54,138
Castings:					
Malleable castings—production (net tons)[d]	.....	34,729	28,340	214,041	.....
Malleable castings—orders (net tons)[d]	.....	**31,136**	24,449	207,647	.....
Steel castings—production (net tons)[d]	.....	**30,646**	50,286	249,484	.....
Steel castings—orders (net tons)[d]	.....	**29,083**	41,537	273,550	.....
Steel Ingots:					
Steel ingot production—monthly (gross tons)[c]	2,230,893	2,635,857	3,059,483	16,402,554	16,024,691
Steel ingot production—daily (gross tons)[c]	89,236	97,624	117,672	105,145	103,385
Steel ingot production—per cent of capacity[c]	40.31	44.10	53.44	47.75	46.70
Employment in Steel Industry:					
Total employees[c]	.....	420,470	455,966	429,834	.....
Total payrolls (thousands of dollars)[c]	.....	46,494	49,467	258,401	.....
Average hours worked per week[c]	.....	33.9	36.2	34.1	.....
Finished Steel:					
Trackwork shipments (net tons)[c]	**4,210**	4,228	6,184	28,647	21,575
Sheet steel sales (net tons)[z]	.....	149,725	114,855	1,185,644	.....
Sheet steel production (net tons)[z]	.....	191,507	199,438	1,249,231	.....
Fabricated shape orders (net tons)[g]	.....	55,600	122,603	595,188	.....
Fabricated shape shipments (net tons)[g]	.....	79,336	104,041	462,071	.....
Fabricated plate orders (net tons)[d]	.....	17,630	27,395	138,833	.....
Reinforcing bar awards (net tons)[c]	14,985	12,080	21,315	110,885	112,755
U. S. Steel Corpn. shipments (tons)[h]	**578,108**	598,915	985,337	3,678,895	3,553,999
Ohio River steel shipments (net tons)[i]	.....	78,106	83,718	336,432	.....
Fabricated Products:					
Automobile production, U. S. and Canada[k]	***352,207**	385,486	321,970	1,796,423	2,348,606
Construction contracts, 37 Eastern States[l]	**$148,005,200**	$126,718,600	$127,055,400	$854,101,900	$696,685,300
Steel barrel shipments (number)[d]	.....	554,102	696,349	3,826,114	.....
Steel furniture shipments (dollars)[d]	.....	$1,214,163	$1,045,539	$5,836,711	.....
Steel boiler orders (sq. ft.)[d]	.....	640,824	359,749	1,916,040	.....
Locomotive orders (number)[m]	3	2	3	83	16
Freight car orders (number)[m]	5,151	2	1,217	23,383	6,583
Machine tool index[n]	91.1	73.3	35.3	†42.6	.....
Foundry equipment index[o]	.....	100.7	70.4	†68.3	.....
Foreign Trade:					
Total iron and steel imports (gross tons)[p]	.....	47,719	24,858	167,638	.....
Imports of pig iron (gross tons)[p]	.....	**23,174**	5,168	65,386	.....
Imports of all rolled steel (gross tons)[p]	.....	18,905	11,818	55,980	.....
Total iron and steel exports (gross tons)[p]	.....	286,599	219,406	1,253,174	.....
Exports of all rolled steel (gross tons)[p]	.....	65,255	71,965	494,767	.....
Exports of finished steel (gross tons)[p]	.....	60,487	61,425	429,547	.....
Exports of scrap (gross tons)[p]	.....	209,425	143,115	738,848	.....
British Production:					
British pig iron production (gross tons)[r]	**529,300**	558,900	514,900	2,898,400	3,172,000
British steel ingot production (gross tons)[r]	**770,000**	853,300	757,500	4,507,300	4,801,200
Non-Ferrous Metals:					
Lead production (net tons)[s]	.....	37,358	33,218	213,697	.....
Lead shipments (net tons)[s]	.....	32,341	28,276	178,444	.....
Zinc production (net tons)[t]	34,677	34,597	25,160	184,008	209,987
Zinc shipments (net tons)[t]	29,393	35,652	30,217	189,896	215,083
Deliveries of tin (gross tons)[v]	4,615	3,950	3,845	22,445	28,390

*Preliminary. †Three Months' Average.

Sources of figures: [a] Lake Superior Iron Ore Association; [b] Bureau of Mines; [c] THE IRON AGE; [d] Bureau of the Census; [e] American Iron and Steel Institute; [z] National Association of Flat-Rolled Steel Manufacturers; [g] American Institute of Steel Construction; [h] United States Steel Corpn.; [i] United States Engineer, Pittsburgh; [k] When preliminary, from Automobile Manufacturers Association—Final figures from Bureau of the Census; [l] F. W. Dodge Corpn.; [m] *Railway Age;* [n] National Machine Tool Builders Association; [o] Foundry Equipment Manufacturers Association; [p] Department of Commerce; [r] British Iron and Steel Federation; [s] American Bureau of Metal Statistics; [t] American Zinc Institute, Inc.; [v] New York Commodities Exchange.

Steel Production Rises Four Points to 40½ Per Cent of Capacity

Large Gain Is More Encouraging Than 4½-Point Rebound in Week Following Holiday—Increased Output Necessitated Despite Light Automotive Demand

RISING four points to 40½ per cent of capacity, steel ingot production this week registered one of the most spectacular gains ever experienced in midsummer. The 11 per cent advance followed a rise of 14 per cent in the preceding week, but the earlier increase represented normal recovery from a holiday period.

The gain in steel output is all the more significant because it was apparently accomplished without the aid of the automobile companies whose purchases are barely holding their own, if not tapering off. Production advances of seven and five points respectively occurred in the important Chicago and Pittsburgh districts where heavy steel lines are predominant. On the other hand, the Cleveland rate moved up only three points and in the Valleys and at Detroit activity was unchanged. In the Philadelphia territory output also barely held its own, while increases were registered in all other centers.

The situation is in definite contrast with that which prevailed a year ago when steel output was at 28 per cent and headed for an almost uninterrupted decline extending over two months. This year improved activity in August was already a foregone conclusion, and it now seems nearly as certain that the upturn is getting under way a full month ahead of general expectations.

The sharp increase in steel production in the middle of the summer when output had been expected to be approaching its lowest level of the year may be attributed largely to improved business in bars, structural steel and tin plate. Demand for construction steel has been at a very low ebb for several months and has afforded mills little support. It is significant also that not nearly all of the jobs let recently are being financed by Federal funds and that the effects of the $4,880,000,000 works relief appropriation have not been felt at all.

Structural lettings during the week amounted to 17,000 tons, including 3200 tons for a tunnel approach at New York, 1825 tons for a steel mill structure at Middletown, Ohio, and 1700 tons for an insurance building in Washington. In the preceding week structural awards totaled 21,800 tons. New projects this week call for 9700 tons, comparing with 19,500 tons in the previous week.

A 20-point rise in tin plate operations from 65 to 85 per cent of capacity was a surprise even to producers. Many mills are running full and it is likely that the current high rate can be continued. Canning crop reports are excellent and mill warehouse stocks which have been reduced to a relatively normal basis are not being increased.

Railroad purchases are being made somewhat more freely and the prospects of general industrial improvement in the fall is leading the carriers to examine carefully the condition of their rolling stock and rights of way. The week's rail purchases include 11,200 tons by the Milwaukee Road and 7500 tons by the Illinois Central, while 6000 tons of accessories has been ordered at Chicago. The Seaboard Air Line is in the market for 12,000 tons of rails and the Chesapeake & Ohio for 4500 tons. The latter road has also placed five locomotives and the Canadian National is in the market for 15. The Norfolk Southern will take bids July 22 on 500 box cars to be built in its own shops.

Farm implement makers have not diminished their steel requirements and stove makers are active in the Cleveland, Chicago and St. Louis districts. Buying by makers of other household equipment is rather light. Jobbers have resumed their normal purchases following a period of uncertainty after the collapse of the NRA, which brought their stocks to an abnormally low level. This is also true of many small miscellaneous consumers of steel.

Steel prices rather than orders are the center of interest in the automotive industry. One of the larger companies continues to tempt steel producers with an order for 40,000 to 90,000 tons of steel for third quarter delivery, but is expected to place the business this week whether a concession is obtainable or not. Toledo, Ohio, steel consumers are also actively seeking the same delivered price concessions which were accorded Michigan buyers under the code and some producers are said to favor the granting of their request.

As a natural forerunner to the placing of steel for new models, automobile makers are now active buyers of machine tools, presses and other equipment. Expenditures this month will run into millions of dollars and the index of new orders for machine tools reached the highest level in more than five years during June. The new trade agreement with Russia is expected to be of further benefit to this industry as well as to makers of other types of equipment and will thus benefit the steel industry indirectly.

Forecasting higher steel-making operations, scrap prices have advanced at Chicago, Cleveland, Detroit and Buffalo and are strong in other important consuming centers. THE IRON AGE composite price for scrap has risen to $10.83 a ton from $10.75 a week ago. The pig iron and finished steel composites are unchanged at $17.84 a ton and 2.124c. a lb. respectively.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous; Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

Per Gross Ton:	July 16, 1935	July 9, 1935	June 18, 1935	July 17, 1934
No. 2 fdy., Philadelphia	$20.3132	$20.3132	$20.3132	$20.26
No. 2, Valley furnace	18.50	18.50	18.50	18.50
No. 2 Southern, Cin'ti	19.2007	19.2007	19.2007	19.13
No. 2, Birmingham†	14.50	14.50	14.50	14.50
No. 2 foundry, Chicago*	18.50	18.50	18.50	18.50
Basic, del'd eastern Pa.	19.8132	19.8132	19.8132	19.76
Basic, Valley furnace	18.00	18.00	18.00	18.00
Malleable, Chicago*	18.50	18.50	18.50	18.50
Malleable, Valley	18.50	18.50	18.50	18.50
L. S. charcoal, Chicago	24.2528	24.2528	24.2528	24.04
Ferromanganese, seab'd, carlots	85.00	85.00	85.00	85.00

†This quotation is for delivery in South; in the North prices are 38c. a ton under delivery quotations from nearest Northern furnace.

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$36.37½	$36.37½	$36.37½	$36.37½
Light rails, Pittsburgh	35.00	35.00	35.00	35.00
Rerolling billets, Pittsburgh	27.00	27.00	27.00	27.00
Sheet bars, Pittsburgh	28.00	28.00	28.00	28.00
Slabs, Pittsburgh	27.00	27.00	27.00	27.00
Forging billets, Pittsburgh	32.00	32.00	32.00	32.00
Wire rods, Pittsburgh	38.00	38.00	38.00	38.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.70	1.70	1.70	1.70

Finished Steel

Per Lb.:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.80	1.80	1.80	1.80
Bars, Chicago	1.85	1.85	1.85	1.85
Bars, Cleveland	1.85	1.85	1.85	1.85
Bars, New York	2.15	2.15	2.15	2.13
Plates, Pittsburgh	1.80	1.80	1.80	1.80
Plates, Chicago	1.85	1.85	1.85	1.85
Plates, New York	2.09	2.09	2.09	2.08
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.80
Structural shapes, Chicago	1.85	1.85	1.85	1.85
Structural shapes, New York	2.06¼	2.06¼	2.06¼	2.05¼
Cold-finished bars, Pittsburgh	1.95	1.95	1.95	2.10
Hot-rolled strips, Pittsburgh	1.85	1.85	1.85	1.85
Cold-rolled strips, Pittsburgh	2.60	2.60	2.60	2.60

Finished Steel

Per Lb.:	July 16, 1935 Cents	July 9, 1935 Cents	June 18, 1935 Cents	July 17, 1934 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.40	2.40	2.40	2.45
Hot-rolled annealed sheets, No. 24, Gary	2.50	2.50	2.50	2.55
Sheets, galv., No. 24, P'gh	3.10	3.10	3.10	3.10
Sheets, galv., No. 24, Gary	3.20	3.20	3.20	3.20
Hot-rolled sheets, No. 10, P'gh	1.85	1.85	1.85	1.85
Hot-rolled sheets, No. 10, Gary	1.95	1.95	1.95	1.95
Wire nails, Pittsburgh	2.60	2.60	2.60	2.60
Wire nails, Chicago dist. mill	2.65	2.65	2.65	2.65
Plain wire, Pittsburgh	2.30	2.30	2.30	2.30
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.35
Barbed wire, galv., Pittsburgh	3.00	3.00	3.00	3.00
Barbed wire, galv., Chicago dist. mill	3.05	3.05	3.05	3.05
Tin plate, 100 lb. box, P'gh.	$5.25	$5.25	$5.25	$5.25

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$11.75	$11.75	$11.75	$11.75
Heavy melting steel, Phila.	10.50	10.50	10.50	10.50
Heavy melting steel, Ch'go	**10.25**	10.00	9.87½	9.50
Carwheels, Chicago	**10.75**	10.50	10.50	9.50
Carwheels, Philadelphia	11.25	11.25	11.25	12.50
No. 1 cast, Pittsburgh	13.25	13.25	13.25	12.25
No. 1 cast, Philadelphia	11.25	11.25	11.25	11.75
No. 1 cast, Ch'go (net ton)	**9.25**	9.00	9.00	8.50
No. 1 RR. wrot., Phila.	10.25	10.25	10.25	11.25
No. 1 wrot., Ch'go (net)	**8.25**	8.00	7.75	7.25

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.25	$3.25	$3.50	$3.85
Foundry coke, prompt	4.00	4.00	4.00	4.60

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery	7.75	7.75	8.75	8.75
Lake copper, New York	8.12½	8.12½	9.12½	9.12½
Tin (Straits), New York	52.37½	52.37½	51.00	51.95
Zinc, East St. Louis	4.30	4.30	4.30	4.30
Zinc, New York	4.67½	4.67½	4.67½	4.65
Lead, St. Louis	4.00	4.00	3.85	3.60
Lead, New York	4.15	4.15	4.00	3.75
Antimony (Asiatic), N. Y.	12.75	12.75	12.75	8.12½

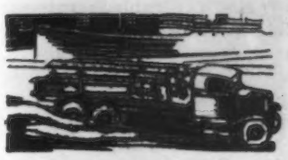
On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
July 16, 1935	2.124c. a Lb.	$17.84 a Gross Ton	$10.83 a Gross Ton
One week ago	2.124c.	17.84	10.75
One month ago	2.124c.	17.84	10.71
One year ago	2.131c.	17.90	10.58
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1935	2.124c., Jan. 3	2.124c., Jan. 8	$17.90, Jan. 8	$17.83, May 14	$12.33, Jan. 8	$10.33, April 23
1934	2.199c., April 24	2.008c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	2.015c., Oct. 3	1.867c., April 18	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.273c., Jan. 7	2.013c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22

Pittsburgh Steel Output Advances Five Points



Valley Production Begins Week Unchanged While Wheeling District Activity Is 10 Points Higher—Tin Plate Output Up 20 Points to 85 Per Cent

PITTSBURGH, July 16.—Steel ingot output in the Pittsburgh district has advanced five points this week to 35 per cent of capacity. Production in the Wheeling district has risen 10 points to 65 per cent, representing a 27-point gain since the holiday week. Schedules in the Valleys and nearby northern Ohio mills are beginning the week unchanged at 41 per cent but may tend higher toward the close.

Even at the higher rate of activity now prevailing in the Pittsburgh area, steel demand seems to have obtained a firmer footing and present indications foreshadow no early recession. This optimistic outlook is being based primarily upon the extraordinary steadiness of miscellaneous demand which is the backbone of the present steel market.

Of no little importance also is the excellent showing of tin plate demand which is accounting this week for a 20-point increase in tin plate output to about 85 per cent of capacity. This record in itself is unusual following as it does the heavy movement of tin plate in the first six months of this year. Based on crop outlook, July shipments may possibly exceed those in June.

Fill-in orders for automotive steel items are dribbling in but ordering against new model assemblies is not expected to reach important proportions until some time late next month. An inquiry for 40,000 to 90,000 tons of flat-rolled steel for a leading automobile producer has not thus far aroused unusual interest in this district since there is some conjecture as to whether the full tonnage inquired for will eventually be purchased.

The virtual death of the Allegheny County Authority, which had planned a number of large bridge and other construction projects that had promised substantial demand for plates and structural steel, has dealt a disappointing blow to producers of heavy hot rolled products in this district.

Pig Iron

Spot buying has improved slightly since July 4. Owing to the holiday week, volume of business in the first half of July, however, failed to measure up to bookings in the same period in June. The spare transactions in the open market still are a poor barometer of pig iron consumption in this district, since so many reciprocal arrangements now ruling prevent requirements from reaching the open market. The Standard Sanitary Mfg. Co., which recently purchased a small tonnage for its Pittsburgh district plant, is reported to have covered also for its Baltimore and Louisville plants.

Semi-Finished Steel

A substantial improvement in tin plate operations has stimulated a heavier flow of sheet bars for tin plate conversion. Billets and slabs also are moving more regularly, while scattered increases in sheet bar shipments to detached sheet mills are evident. Demand for forging quality billets is narrow in keeping with final runs on current automobile models. The most encouraging feature of this market is the generally low position of inventories, which are subject almost weekly to replenishments.

Bolts, Nuts and Rivets

Demand is drifting, with specifications on third quarter contracts in small volume. The Navy is taking bids on its general requirements for various points in connection with the construction of 13 war vessels. Price concessions do not appear to be so general. In the Pittsburgh area discount cards are fairly well observed.

Rails and Track Accessories

Early placement of a substantial tonnage of rails and track accessories for the relocating of tracks in the Muskingum Valley Conservancy district project is expected. Bids were opened last week on six different sections of track work, but low bidders have not yet been awarded general contracts. The Chesapeake & Ohio is in the market for about 4300 tons of rails and track fastenings.

Reinforcing Steel

A substantial amount of reinforcing steel will be specified soon for six projects covering the relocating of railroad tracks in the Muskingum Valley Conservancy district program. Bids opened last week revealed the following low bidders, which have not yet received general contracts: Elmer O. Vogt, Massillon, Ohio, relocating Baltimore & Ohio tracks at Bolivar reservoir; Arundel Corpn., Baltimore, Wheeling & Lake Erie at Dover, Ohio; Gilbert Construction Co., Beckley, W. Va., Wheeling & Lake Erie tracks at Beach City reservoir; Tri-State Engineering Co., Waynesburg, Pa., Baltimore & Ohio tracks at Dover; Myers Brothers Co., Campbellsburg, Ind., Erie Railroad tracks at Charles Mills reservoir.

Cold-Finished Bars

Demand is on a fairly even keel, with some producers reporting heavier business thus far in July than in the first half June tonnage. The market is kept active by well diversified orders. Automotive specifications for 1935 assemblies continue to wane, while ordering against the new models has not made any headway here. Manufacturers of agricultural implements, machinery and electrical equipment are figuring prominently in the current movement. Jobbers are appearing more frequently in the market for small tonnages.

Plates and Shapes

Contracts recently awarded to car builders in this district have not yet been translated into plate orders. Important barge inquiries also have not been acted upon. The accrued demand for both water and rail carrier equipment is therefore quite substantial. The usual amount of plates for railroad repairs is being specified. A fair tonnage for tank construction pends, but this outlet is relatively quiet.

Structural steel awards expanded sharply here in the past week, with McClintic-Marshall Corpn. successful on several important projects that will require about 7500 tons. In the Pittsburgh area that company will furnish 800 tons for the Viscose Co. building at Meadville, Pa., and 220 tons for John Conroy school in Pittsburgh. About 1800 tons for a mill building at Middletown, Ohio, was placed by the American Rolling Mill Co. with Ingalls Iron Works. Fresh inquiry is lagging far behind the volume of awards, with the most recent list

uninteresting from a tonnage standpoint.

Tubular Products

The steadiness of this market is a feature. An analysis of current demand reveals the unchanged position of various consuming fields. Oil-country goods are maintaining first place, while standard pipe follows. The recent flurry in the line pipe market has temporarily subsided, with no important tonnages reported placed in the past week. Seamless commercial and locomotive boiler tubes are moving more regularly in small lots. No major demand for mechanical tubing for 1936 motor cars assemblies has appeared thus far.

Bars

Demand appears to be exceeding seasonal expectations, with some producers reporting increasingly heavier tonnage since the Independence Day week. Summer schedules do not appear to be ruling in some manufacturing lines, and bar mills are benefiting by the contra-seasonal activity in several important quarters, particularly the agricultural implement industry. The automotive industry is not yet far enough along in its new model activities to add much to hot-rolled bar demand, but some improvement from that source is expected this month. Cold finishers are specifying a little more freely.

Wire Products

Although actual increases in consumption are difficult to discern, a well scattered demand is sustaining activity in this market. Shipments to farm areas perhaps are the keystone of the present favorable conditions, which are contrary to seasonal trends. Wire mill output in the Pittsburgh district is holding at 30 to 35 per cent.

Sheets

Miscellaneous demand continues to furnish chief support to sheet mill operations, which for the industry are unchanged this week at 50 per cent. Only fill-in orders from the automotive industry are in evidence, with sheet orders for 1936 models still unimportant in tonnage. A leading automobile producer is inquiring for 45,000 to 90,000 tons of flat-rolled steel, including a large tonnage of sheets, for reasonably prompt delivery. This inquiry, it is believed, will provide the first real test of present quotations, which are being rigidly adhered to by all producers in this district.

Tin Plate

Specifications from can makers have appeared in such heavy volume since the holiday week that tin plate operations in the current period will soar 20 points to approximately 85 per cent of theoretical capacity. Eight tin plate producers, making the bulk of the industry's output, are operating at capacity. An encouraging feature is that mills are not adding to warehouse stocks and are shipping virtually their entire make.

Strip Steel

Production has leveled off after the pickup following the holiday week, and this week will hold at around 30 to 35 per cent. If the volume of specifications continues to hold current proportions, some mills will soon have to schedule heavier production. Important changes, however, probably will not become general until the automotive industry begins to specify in a large way for its new model steel requirements.

Coke and Coal

This market continues in a state of semi-paralysis, largely owing to the waiting attitude of producers and consumers on the Guffey bill. With the threat of strikes no longer imminent and in the face of the summer season, little activity is believed in store for some weeks. Prices on bituminous coal and furnace and foundry coke have held in the past week, but the absence of any important demand is forestalling an actual test of current quotations.

Scrap

Dealer transactions are ruling this market which has absorbed some of the favorable sentiment prevailing in the steel industry. On the strength of general improvement and an extremely slow flow of scrap from small dealers, brokers in short position are offering prices higher than those realized on recent orders. Some brokers with $12 No. 1 steel orders are offering as high as $12.25 to cover. On the other hand, mill scrap buyers are not evincing much promise at the moment of covering for any major tonnages during July and a more convincing upturn in steel mill activity evidently is being awaited before scrap buying broadens.

Allegheny Stock Offering Not New

THE offering of 60,000 shares of Allegheny Steel Co. common stock, announced on July 15, does not represent new financing or issue of new stock by the company, but consists of stock already outstanding which is being sold by the holders to provide a more adequate floating supply, according to Harry E. Sheldon, president of the company.

The company's application to authorize 18,772 shares of common stock has nothing to do with the present offering. These shares, according to Mr. Sheldon, were originally authorized to be issued in connection with the company's acquisition of West Penn Steel Co., but were not needed and never were issued. The company now seeks to authorize the issue of this stock to be used eventually for compensating its key employees in accordance with its custom of many years standing.

Weekly Indications of Steel Activity

From THE IRON AGE

	July 16, 1935	July 9, 1935	June 18, 1935	July 17, 1934	Average, Year to Date 1935	Average, Year to Date 1934
Steel ingot operations—Per cent of capacity	40.5	36.5	38.0	28.0	45.2	46.1

	Week Ended July 16, 1935	Week Ended July 9, 1935	Week Ended June 18, 1935	Week Ended July 17, 1934	Year to Date 1935	Year to Date 1934
Fabricated structural steel awards	17,000	21,800	25,200	8,500	378,352	463,720
Fabricated plate awards	6,225	1,185	3,600	925	65,582	80,097
Sheet steel piling awards	0	0	0	150	23,365	37,390
Reinforcing bar awards	4,400	920	3,150	7,825	118,075	121,610

Ingot Output Rises Seven Points in Chicago Area

Production Increase to 49 Per Cent Occasioned By Shortage of Raw Steel As Well As Unexpectedly Heavy Orders

CHICAGO, July 16.—Ingot output has risen sharply to 49 per cent of capacity, a gain of seven points within a week. Although there is a moderate gain in shipments, the upturn in ingot production measures for the most part a shortage of raw steel which mills have been confronting for about three weeks.

Early in the summer the trade expected July and the first half of August to mark the low point of the summer recession in business but in this they have been happily disappointed. July has not dropped as low as had been expected and for three weeks both specifications and new buying have been making very small but nevertheless indicative gains.

Some mills were reluctant to add capacity until they could see their way clear to make real use of it. This hesitancy has resulted in a shortage of raw steel and sellers are now convinced that August instead of being another low summer month will actually begin the turn upward to the fall months that are expected to show a substantial volume of business.

This situation appears to be having its effects on the scrap market. Prices are stronger and supplies are meager. Dealers see still higher prices in the offing as a necessity to start a flow that will be adequate for consumptive requirements.

Fabricators, foundrymen, forgers and reinforcing bar dealers are centering their attention on Government work on the Mississippi River which will offer attractive tonnages over the next two months.

Pig Iron

Shipments are still running about 20 per cent below June but releases are in sight which, before the end of the month, will probably reduce the percentage to about 10. Some Michigan foundries that had expected to be down by this time are actually increasing schedules for short runs. Hardware foundries report July business as being measurably better than a year ago.

Reinforcing Bars

Base prices for reinforcing bars are holding, but extras are being shaved when attractive tonnages are involved. The 1000 tons of reinforcing bars to be used for the Indianapolis housing project will be furnished by Laclede Steel Co. Inland Steel Co. will furnish 1300 tons for the Sanitary District, Chicago. All other awards are small. The inquiry list is promising, including a long list of heavy tonnages for locks and dams on the Mississippi River on which bids will be opened at the rate of one a week for the next 10 or 12 weeks. Highway and bridge work is very slow because States have not yet agreed with the Federal Government on the matter of proportional expenditures for materials. There is an abundance of small inquiry that is keeping estimating departments busy.

Cast Iron Pipe

Waldo, Wis., has ordered 2600 ft. of 4 to 6-in. pipe. All other orders are small and spotty. Some sellers report that orders for one to three carloads each have been brisk in recent days while others say that all business, both large and small, is very dull. Prices for cast iron pipe remain steady.

Warehouse Business

The July movement is keeping up with June and is 15 per cent ahead of July, 1934. A gain in city business and a drop in demand from the country has resulted in the former taking the lead. The undertone of this market is strong and warehousemen look for a fall upturn which will start from a higher level than a year ago.

Plates

A fair flow of orders for light gage plates leaves mills in an unbalanced condition and without the tonnage that is sorely needed for satisfactory operations. There has been further delay in buying the materials that will be used for the Chesapeake & Ohio cars and there is as yet no official word as to disposition of the Chicago street cars. Once again there is considerable discussion as to the condition of railroad rolling stock and its ability to handle successfully the strain that would come from a real bulge in business. Shippers are interested in this question and steel mills take a determined stand that heavy car buying is not in the far distant future.

Wire Products

Output has sagged to 40 per cent of capacity and at this rate mills are now able to balance stocks and to build up a few lines that had run unusually low. This moderate drop in demand is more noticeable from farm areas than from the manufacturing trade which is still getting excellent support from automobile centers. Wheat is being harvested in the Prairie States and those farmers have had to lay aside maintenance chores for the time being. In some other agricultural areas weather conditions are less favorable but there is no serious threat to crops unless it be that corn was planted late. Reinforcing mesh is moving faster but the tonnage is far below what had been anticipated for this summer's movement.

Structural Material

The pied piper of Government locks and dams on the Mississippi River has stripped Chicago of its leading fabricators who for many weeks will spend much of their time moving between St. Paul and Rock Island in efforts to share in the only large and active tonnages that are before the trade. Awards during the last week totaled 8500 tons. Fresh inquiries, exclusive of Mississippi River work, total not more than 4000 tons. All shop backlogs are dwindling at a fast rate.

Bars

This market has been very steady for the last three weeks and there is no sign of a break in it. In fact mills feel that they are on the verge of a bulge in demand. They point to the fact that automobile manufacturers' efforts to smooth out production curves are meeting with success, and to the added fact that demand has carried forward in surprising volume to the time when new automobile models are beginning to make their appearances. In the meantime, farm implement and tractor plants remain busily engaged.

Sheets

Demand remains on an even keel and no major changes in the market are in sight. There is still

good support from some automobile plants. Containers and barrel manufacturers are slightly less active and shelving builders remain in a summer slump. Prices remain firm.

Rails

The Milwaukee Road has ordered 11,200 tons of rails and the Illinois Central has purchased 7500 tons. New accessory business, part of which is for the above railroads, totals 6000 tons. Mills are counting on 10,000 tons from a Southwestern railroad and a few miscellaneous odd lots to complete purchases until buying for 1936 gets under way.

Scrap

Railroad, industrial and dealer offerings are unusually light and there is a strong undertone throughout the scrap market. There is somewhat of a scramble to cover old orders, especially those taken at steel mills at from $10 to $10.50 a ton. Steel mill operations have gained for the second consecutive week, and, should the advance continue much further, it seems certain that higher prices will be a necessity in order to induce an adequate flow of scrap. Dealers freely pay $10.25 a gross ton for heavy melting teel. Prices are nominal but strong.

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DESIGNERS & MAKERS OF DEEP DRAWN
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Cast Iron Pipe

Waldo, Wis., has awarded 2400 ft. of 4 and 5-in., and 200 ft. of 6-in. to United States Pipe & Foundry Co.

Mounton, Ark., plans pipe lines for water system. Fund of $60,000 is being arranged through Federal aid for this and other waterworks installation, also sewer system.

Charleston, Ark., plans pipe lines for water supply. Fund of $26,000 has been secured through Federal aid for this and other waterworks installation, including elevated steel tank and tower.

Cunningham, Kan., has authorized bond issue of $22,000 for pipe lines for water system and other waterworks installation. Hefling & Hughes Engineering Co., 20½ West Second Street, Hutchinson, Kan., is consulting engineer.

Daytona Beach, Fla., will ask bids soon for 14-in. pipe for main trunk line for water supply between mainland and peninsula; also for 300,000-gal. elevated steel tank and tower and other waterworks equipment. Fund of $275,000 is being arranged through Federal aid. Robert & Co., Inc., Bona Allen Building, Atlanta, Ga., is consulting engineer.

Brigantine, N. J., plans pipe lines for water system; also 150,000-gal. elevated steel tank and other waterworks equipment. Fund of $30,000 is being secured through Federal aid. V. S. Haneman, Guarantee Trust Building, Atlantic City, N. J., is consulting engineer.

Santa Cruz, Cal., plans pipe lines for extensions in water system. Fund of about $30,000 will be arranged through Federal aid. Alvin Weymouth, water commissioner, is in charge.

Sheehan Pipe Line Construction Co., National Bank of Tulsa Building, Tulsa, Okla., has secured award from Southern Hills Country Club, Philcade Building, for pipe lines for golf course, including pumping station. Cost about $100,000.

Manteo, N. C., plans water pipe lines and other waterworks installation. Fund of $30,000 is being secured through Federal aid.

Mooringsport, La., plans pipe lines for water system and other waterworks equipment. Bond issue of $35,000 has been arranged. Charles D. Evans, Slattery Building, Shreveport, La., is consulting engineer.

Tillsonburg, Ont., will soon take bids for about two miles of 8-in. for main water trunk line; also for pumping station. D. H. Fleming, 125 Ranleigh Street, Toronto, Ont., is engineer.

Allen County Board of Commissioners, Courthouse, Fort Wayne, Ind., plans about seven and one-half miles of pipe for water supply to group of institutional buildings on Lima Road; also new filtration plant and other distribution facilities. Financing is being arranged through Federal aid. Henry Gottschalk, address noted, is county engineer.

Pine Grove, W. Va., has secured fund of $19,636 through Federal aid for pipe lines for water system, pumping station and other waterworks installation.

Jacksonville, Ore., has awarded 138 tons of 6 and 8-in. to Consolidated Supply Co.

San Francisco let a contract for 127 tons to American Cast Iron Pipe Co.

Omak, Wash., has purchased 141 tons of French pipe from Pacific Waterworks Supply Co.

Prices of Finished Steel and Iron Products

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel — *Base per Lb.*

f.o.b. Pittsburgh	1.80c.
f.o.b. Chicago	1.85c.
f.o.b. Gary	1.85c.
f.o.b. Duluth	1.95c.
Del'd Detroit	1.95c.
f.o.b. Cleveland	1.85c.
f.o.b. Buffalo	1.90c.
Del'd Philadelphia	2.11c.
Del'd New York	2.15c.
f.o.b. Birmingham	1.95c.
f.o.b. cars dock Gulf ports	2.20c.
f.o.b. cars dock Pacific ports	2.35c.

Rail Steel

(For merchant trade)

f.o.b. Pittsburgh	1.70c.
f.o.b. Chicago	1.75c.
f.o.b. Gary	1.75c.
f.o.b. Moline, Ill.	1.75c.
f.o.b. Cleveland	1.75c.
f.o.b. Buffalo	1.80c.
f.o.b. Birmingham	1.85c.
f.o.b. cars dock Gulf ports	2.10c.
f.o.b. cars dock Pacific ports	2.25c.

Billet Steel Reinforcing

(Straight lengths as quoted by distributers)

f.o.b. Pittsburgh	2.05c.
f.o.b. Chicago	2.10c.
f.o.b. Gary	2.10c.
Del'd Detroit	2.20c.
f.o.b. Cleveland	2.10c.
f.o.b. Youngstown	2.10c.
f.o.b. Buffalo	2.10c.
f.o.b. Birmingham	2.10c.
f.o.b. cars dock Gulf ports	2.45c.
f.o.b. cars dock Pacific ports	2.45c.

Rail Steel Reinforcing

(Straight lengths as quoted by distributers)

f.o.b. Pittsburgh	1.90c.
f.o.b. Chicago	1.95c.
f.o.b. Gary	1.95c.
f.o.b. Cleveland	1.95c.
f.o.b. Youngstown	1.95c.
f.o.b. Buffalo	1.95c.
f.o.b. Birmingham	1.95c.
f.o.b. cars dock Gulf ports	2.30c.
f.o.b. cars dock Pacific ports	2.30c.

Iron

f.o.b. Chicago	1.80c.
f.o.b. Terre Haute, Ind.	1.75c.
f.o.b. Louisville, Ky.	2.10c.
f.o.b. Danville, Pa.	1.80c.
f.o.b. Berwick, Pa.	1.70c.

Cold Finished Bars and Shafting*

Base per Lb.

f.o.b. Pittsburgh	1.95c.
f.o.b. Chicago	2.00c.
f.o.b. Gary	2.00c.
f.o.b. Cleveland	2.00c.
f.o.b. Buffalo	2.05c.
Del'd Detroit	2.15c.
Del'd eastern Michigan	2.20c.

* In quantities of 10,000 to 19,000 lb.

Fence and Sign Posts

Angle Line Posts

Base per Net Ton

f.o.b. Pittsburgh	$50.00
f.o.b. Chicago	50.00
f.o.b. Duluth	51.00
f.o.b. Cleveland	50.00
f.o.b. Birmingham	53.00
f.o.b. Houston, Orange, Beaumont, Galveston	59.00
f.o.b. Mobile	58.00
f.o.b. New Orleans, Lake Charles, Corpus Christi	59.00
f.o.b. cars dock Pacific ports	63.00

Plates

Base per Lb.

f.o.b. Pittsburgh	1.80c.
f.o.b. Chicago	1.85c.
f.o.b. Gary	1.85c.
Del'd Cleveland	1.995c.
f.o.b. Coatesville	1.90c.
f.o.b. Sparrows Point	1.90c.
Del'd Philadelphia	1.99c.
Del'd New York	2.09c.
f.o.b. Birmingham	1.95c.
f.o.b. cars dock Gulf ports	2.50c.
f.o.b. cars dock Pacific ports	2.35c.
Wrought iron plates, f.o.b. P'gh	3.20c.

Floor Plates

f.o.b. Pittsburgh	3.35c.
f.o.b. Chicago	3.40c.
f.o.b. Coatesville	3.45c.
f.o.b. cars dock Gulf ports	3.75c.
f.o.b. cars dock Pacific ports	3.90c.

Structural Shapes

Base per Lb.

f.o.b. Pittsburgh	1.80c.
f.o.b. Chicago	1.85c.
Del'd Cleveland	1.995c.
f.o.b. Buffalo	1.90c.
f.o.b. Bethlehem	1.90c.
Del'd Philadelphia	2.015c.
Del'd New York	2.0625c.
f.o.b. Birmingham (standard)	1.95c.
f.o.b. cars dock Gulf ports	2.20c.
f.o.b. cars dock Pacific ports	2.35c.

Steel Sheet Piling

Base per Lb.

F.o.b. Pittsburgh	2.15c.
F.o.b. Chicago	2.25c.
F.o.b. Buffalo	2.25c.
F.o.b. cars dock Gulf ports	2.60c.
F.o.b. cars dock Pacific ports	2.60c.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

Base per Lb.

No. 10, f.o.b. Pittsburgh	1.85c.
No. 10, f.o.b. Gary	1.95c.
No. 10, del'd Detroit	2.05c.
No. 10, del'd Phila.	2.16c.
No. 10, f.o.b. Birmingham	2.00c.
No. 10, f.o.b. dock cars Pacific ports	2.40c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.40c.
No. 24, f.o.b. Gary	2.50c.
No. 24, del'd Detroit	2.60c.
No. 24, del'd Phila.	2.71c.
No. 24, f.o.b. Birmingham	2.55c.
No. 24, f.o.b. dock cars Pacific ports	3.05c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.50c.
No. 10 gage, f.o.b. Gary	2.60c.
No. 10 gage, del'd Detroit	2.70c.
No. 10 gage, del'd Phila.	2.81c.
No. 10 gage, f.o.b. Birmingham	2.65c.
No. 10 gage, f.o.b. dock cars Pacific ports	3.10c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.95c.
No. 20 gage, f.o.b. Gary	3.05c.
No. 20 gage, del'd Detroit	3.15c.
No. 20 gage, del'd Phila.	3.26c.
No. 20 gage, f.o.b. Birmingham	3.10c.
No. 20, f.o.b. dock cars Pacific ports	3.50c.

Galvanized Sheets

No. 24 gage, f.o.b. Pittsburgh	3.10c.
No. 24, f.o.b. Gary	3.20c.
No. 24, del'd Phila.	3.41c.
No. 24, f.o.b. Birmingham	3.25c.
No. 24, f.o.b. dock cars Pacific ports	3.70c.
No. 24, wrought iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.40c.
F.o.b. Gary	3.50c.
F.o.b. cars dock Pacific ports	4.10c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	3.10c.
No. 20, f.o.b. Gary	3.20c.
No. 20, f.o.b. Birmingham	3.70c.
No. 20, f.o.b. cars dock Pacific ports	3.70c.
No. 10, f.o.b. Pittsburgh	2.50c.
No. 10, f.o.b. Gary	2.60c.
No. 10, f.o.b. Birmingham	3.10c.
No. 10, f.o.b. cars dock Pacific ports	3.10c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.75c.
No. 28, Gary	2.85c.
No. 28, cars dock Pacific Coast ports	3.35c.

Tin Plate

Per Base Box

Standard cokes, f.o.b. P'gh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate

(F.o.b. Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

Base per Lb.

All widths up to 24 in., P'gh	1.85c.
All widths up to 24 in., Chicago	1.95c.
All widths up to 24 in., del'd Detroit	2.05c.
All widths up to 24 in., Birmingham	2.00c.
Cooperage stock, Pittsburgh	2.10c.
Cooperage stock, Chicago	2.30c.

Cold-Rolled Strips

Base per Lb.

F.o.b. Pittsburgh	2.60c.
F.o.b. Cleveland	2.60c.
Del'd Chicago	2.995c.
F.o.b. Worcester	2.80c.

Fender Stock

No. 14, Pittsburgh or Cleveland	2.90c.
No. 14, Worcester	3.30c.
No. 20, Pittsburgh or Cleveland	3.30c.
No. 20, Worcester	3.70c.

Hot-Rolled Rail Steel Strips

Base per Lb.

F.o.b. Pittsburgh	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Birmingham	1.85c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade — *Per Lb.*

Bright wire	2.30c.
Spring wire	2.90c.

Chicago prices on products sold to the manufacturing trade are $1 a ton above Pittsburgh or Cleveland. Worcester and Duluth prices are $2 a ton above, Birmingham $3 above, and Pacific Coast prices $9 a ton above Pittsburgh or Cleveland.

To Jobbing Trade

Qualified jobbers are entitled to a reduction of 20c. a 100 lb. from the base price on carload shipments to stock, and of 10c. a 100 lb. on less-carload shipments to stock.

Base per Keg

Standard wire nails	$2.60
Smooth coated nails	2.60
Galvanized nails:	
15 gage and coarser	4.60
16 gage and finer	5.10

Base per 100 Lb.

Annealed fence wire	$2.45
Galvanized fence wire	2.80
Polished staples	2.90
Galvanized staples	2.55
Barbed wire, galvanized	3.00
Woven wire fence, base column	$3.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

On wire nails, barbed wire, staples and fence wire, prices at Houston, Galveston and Corpus Christi, Tex., New Orleans, Lake Charles, La., and Mobile, Ala., are $6 a ton over Pittsburgh, while Pacific Coast prices are $8 over Pittsburgh. Exception: on fence wire Pacific Coast prices are $11 a ton above Pittsburgh.

On staples and barbed wire, prices of $6 a ton above Pittsburgh are also quoted at Beaumont and Orange, Tex.

Wire Hoops, Twisted or Welded

Off List

F.o.b. Pittsburgh	35 and 2½ off
F.o.b. Chicago	35 off

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel			Wrought Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛	51½	29½	⅛	+91½	+133
¼ to ⅜	53½	35	¼ & ⅜	+1½	+21½
½	58½	47	½	31½	15
¾	62	52	¾	36½	20½
1 to 3	64	55	1 & 1¼	39½	25½
			1½	42½	28
			2	41½	26

Lap Weld

2	60	51	2	37	22½
2½ to 3	63	54	2½ to 3½	38	25
3½ to 6	65	56	4 to 8	40	28½
7 and 8	64	54	9 to 12	38	24½
9 and 10	63½	53½			
11 and 12	63½	52½			

Butt Weld, extra strong, plain ends

⅛	48½	32½	⅛	+12	+45½
¼ to ⅜	51	38	¼ & ⅜	+2½	+34½
½	56½	47½	½	32½	17½
¾	61	52	¾	37½	23½
1 to 3	63	55	1 to 2	43½	29

Lap Weld, extra strong, plain ends

2	58	50	2	40	26
2½ to 3	62	54	2½ to 4	45½	33
3½ to 6	65½	57½	4½ to 6	45	33½
7 and 8	64½	54½	7 & 8	46	33
9 and 10	63½	53½	9 to 12	41½	30
11 and 12	62½	52½			

On standard steel pipe an extra 5% off is allowed on sales to consumers while two 5's off apply on sales to jobbers. On less-than-carload shipments prices are determined by adding 20 and 35% and the carload freight rate to the base card. On structural steel pipe the base card is reduced 2 points and two 5's off are allowed to consumers and three 5's off to jobbers.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Seamless Steel Commercial Boiler Tubes and Locomotive Tubes

(Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots)

		Cold Drawn	Hot Rolled
1 in. o.d.	13 B.W.G.	$ 8.60	$7.82
1¼ in. o.d.	13 B.W.G.	10.19	9.26
1½ in. o.d.	13 B.W.G.	11.26	10.23
1¾ in. o.d.	13 B.W.G.	12.31	11.64
2 in. o.d.	13 B.W.G.	14.35	13.04
2¼ in. o.d.	13 B.W.G.	16.00	14.54
2½ in. o.d.	12 B.W.G.	17.61	16.01
2¾ in. o.d.	12 B.W.G.	19.29	17.54
2¾ in. o.d.	12 B.W.G.	20.45	18.59
3 in. o.d.	12 B.W.G.	21.45	19.50
4½ in. o.d.	10 B.W.G.	41.08	37.35
3½ in. o.d.	11 B.W.G.	27.09	24.63
4 in. o.d.	10 B.W.G.	32.60	29.54
4½ in. o.d.	10 B.W.G.	41.08	37.35
5 in. o.d.	9 B.W.G.	51.56	46.87
6 in. o.d.	7 B.W.G.	79.15	71.96

Extras for less-carload quantities:

25,000 lb. or ft. to 39,999 lb. or ft.	5 %
12,000 lb. or ft. to 24,999 lb. or ft.	12½ %
6,000 lb. or ft. to 11,999 lb. or ft.	25 %
2,000 lb. or ft. to 5,999 lb. or ft.	35 %
Under 2,000 lb. or ft.	50 %

Lapweld Steel and Knobbled Charcoal Iron Pressure Tubes

(Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots)

		Steel	Iron
1¼ in. o.d.	13 B.W.G.	$ 9.72	$20.16
1½ in. o.d.	13 B.W.G.	11.06	21.84
2 in. o.d.	13 B.W.G.	12.38	17.23
2¼ in. o.d.	13 B.W.G.	13.79	19.58
2½ in. o.d.	12 B.W.G.	16.58	24.19
2¾ in. o.d.	12 B.W.G.	17.54	26.46
3 in. o.d.	12 B.W.G.	18.35	28.39
3¼ in. o.d.	11 B.W.G.	21.56	33.95
3½ in. o.d.	11 B.W.G.	23.15	36.16
4 in. o.d.	10 B.W.G.	28.66	45.36
4½ in. o.d.	10 B.W.G.	35.22	50.48
5 in. o.d.	9 B.W.G.	44.25	61.86
6 in. o.d.	7 B.W.G.	68.14	102.46

Quantity Extras:

40,000 lb or ft.	base
25,000 lb. or ft. to 39,999 lb. or ft.	plus 5%
10,000 lb. or ft. to 24,999 lb. or ft.	plus 12½ %
2,000 lb. or ft. to 9,999 lb. or ft.	plus 25%
Under 2,000 lb. or ft.	plus 40%

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago	$48.40
*4-in., del'd Chicago	51.40
6-in. and larger, del'd New York	45.20
4-in. del'd New York	48.20
*6-in. and larger, Birmingham	40.00
*4-in. Birmingham	43.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles	48.00
F.o.b. dock, Seattle	48.50

Class "A" and gas pipe, $3 extra.

*Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $39, Birmingham, and $47.40, delivered Chicago, and 4-in. pipe, $42. Birmingham, and $50.40 a ton, delivered Chicago.

RAILROAD MATERIALS

Rails and Track Supplies

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$36.37½
Angle bars, per 100 lb	2.55

F.o.b. Code Basing Points

Light rails (from billets) per gross ton	$35.00
Light rails (from rail steel) per gross ton	34.00

Base per 100 Lbs.

Spikes, 9/16 in. and larger	$2.40
Spikes, ⅜ in .and smaller	2.40
Tie plates, steel	1.90
Tie plates, Pacific Coast ports	2.00
Track bolts, to steam railroads	3.55
Track bolts, no jobbers, all sizes (per 100 count)	70 per cent off list

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Buffalo, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa.; on spikes alone, Cleveland, Youngstown, Lebanon, Pa., Columbia, Pa., Richmond, Va.

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine bolts	70, 10 and 5
Carriage bolts	70, 10 and 5
Lag bolts	70, 10 and 5
Plow bolts, Nos. 1, 2, 3 and 7 heads	70, 10 and 5
Hot-pressed nuts, blank or tapped, square	70, 10 and 5
Hot-pressed nuts, blank or tapped, hexagons	70, 10 and 5
C.p.c. and t. square or hex. nuts, blank or tapped	70, 10 and 5
Semi-finished hexagon nuts, U.S.S. and S.A.E., all sizes to and incl. 1 in. diameter	70, 10 and 5
Larger than 1 in. diameter	70
Stove bolts in packages, Pittsburgh	75
Stove bolts in packages, Chicago	75
Stove bolts in packages, Cleveland	75
Stove bolts in bulk, Pittsburgh	83
Stove bolts in bulk, Chicago	83
Stove bolts in bulk, Cleveland	83
Tire bolts	60 and 5

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.90
F.o.b. Chicago	3.00
F.o.b. Birmingham	3.05

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 5
F.o.b. Cleveland	70 and 5
F.o.b. Chicago and Birm'g'm	70 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws, 1 in. dia. and smaller	35 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller	75 and 10
Milled headless set screws, cut thread ¾ in. and smaller	75
Upset hex. head cap screws, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller	87½
Upset set screw, cut and oval point	80
Milled studs	65 to 65 and 10

Alloy and Stainless Steel

Alloy Steel Ingots

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Uncropped .....$40 per gross ton

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, $49 a gross ton.

Alloy Steel Bars

Price del'd Detroit is $52.
F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base .....2.45c.
Delivered price at Detroit is .....2.60c.

S.A.E. Series Numbers	Alloy Differential per 100 lb.
2000 (1% Nickel)	$0.25
2100 (1½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.20
6100 Chromium Vanadium Spring Steel	0.70
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicogo, Gary, Cleveland or Buffalo. 2.95c. base per lb.

STAINLESS STEEL No. 302

(17 to 19% Cr. 7 to 9% NI. 0.08 to 0.20% C.)
(Base Prices f.o.b. Pittsburgh)

	Per Lb.
Forging billets	19.55c.
Rerolling slabs	15c.
Bars	23c.
Plates	26c.
Structural shapes	23.
Sheets	33c.
Hot-rolled strip	20¾c.
Cold-rolled strip	27c.
Drawn wire	23c.

Raw and Semi-Finished Steel

Carbon Steel Rerolling Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.
Uncropped .....$29 per gross ton

Carbon Steel Forging Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Birmingham.
Uncropped .....$31 per gross ton

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.

	Per Gross Ton
Rerolling	$27.00
Forging quality	32.00

Delivered Detroit

Rerolling	$30.00
Forging	35.00

Billets Only F.o.b. Duluth

Rerolling	$29.00
Forging	34.00

Sheet Bars

F.o.b. Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open-hearth or Bessemer	$28.00

Skelp

F.o.b. Pittsburgh, Chicago, Youngstown, Buffalo, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved	1.70c.
Universal	1.70c.
Sheared	1.70c.

Tube Rounds

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Cleveland	1.85c.
F.o.b. Buffalo	1.90c.
F.o.b. Birmingham	1.95c.

Wire Rods

(Common, base)

	Per Gross Ton
F.o.b. Pittsburgh	$38.00
F.o.b. Cleveland	38.00
Fo.b. Chicago	39.00
F.o.b. Anderson, Ind.	39.00
F.o.b. Youngstown	39.00
F.o.b. Worcester, Mass.	40.00
F.o.b. Birmingham	41.00
F.o.b. San Francisco	47.00
F.o.b. Galveston	44.00

Pig Iron and Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$19.50	$20.00	$19.00	$20.50
Bethlehem, Pa.	19.50	20.00	19.00	20.50
Birdsboro, Pa.	19.50	20.00	19.00	20.50
Swedeland, Pa.	19.50	20.00	19.00	20.50
Steelton, Pa.	....	....	19.00	....
Sparrows Point, Md.	19.50	....	19.00	....
Neville Island, Pa.	18.50	18.50	18.00	19.00
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Youngstown	18.50	18.50	18.00	19.00
Buffalo	18.50	19.00	17.50	19.50
Erie, Pa.	18.50	19.00	18.00	19.50
Cleveland	18.50	18.50	18.00	19.00
Toledo, Ohio	18.50	18.50	18.00	19.00
Jackson, Ohio	20.25	20.25	19.75	20.75
Detroit	18.50	18.50	18.00	19.00
Hamilton, Ohio	18.50	18.50	18.00	19.00
Chicago	18.50	18.50	18.00	19.00
Granite City, Ill.	18.50	18.50	18.00	....
Duluth, Minn.	19.00	19.00	....	19.50
Birmingham	14.50	14.50	13.50	19.00
Provo, Utah	17.50	....	17.00	....

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District From Everett, Mass.	$20.00	$20.50	$19.50	$21.00
Brooklyn From East. Pa.	21.9289	22.4289	21.9289	22.9289
Newark or Jersey City, N. J. From East. Pa.	20.9873	21.4873	20.4873	21.9873
Philadelphia From Eastern Pa.	20.3132	20.8132	19.8132	21.3132
Cincinnati From Hamilton, Ohio	19.5807	19.5807	19.0807	20.0807
Canton, Ohio From Cleveland and Youngstown	19.8402	19.8402	19.3402	20.3402
Columbus, Ohio From Hamilton, Ohio	20.64	20.64	....	....
Mansfield, Ohio From Cleveland and Toledo	20.3832	20.3832	....	....
Indianapolis From Hamilton, Ohio	20.9289	20.9289	....	....
South Bend, Ind. From Chicago	20.6935	20.6935	....	....
Milwaukee From Chicago	19.57	19.57	....	....
St. Paul From Duluth	20.94	....	....	....
Davenport, Iowa From Chicago	20.3832	20.3832	....	....
Kansas City From Granite City	21.2178	21.2178	....	....
San Francisco, Los Angeles or Seattle. From Provo	22.315	....	....	....

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y. $23.50

GRAY FORGE PIG IRON

Valley furnace $18.00
Pittsburgh district furnace 18.00

CHARCOAL PIG IRON

Lake Superior furnace $21.00
Delivered Chicago 24.2528
Delivered Buffalo 24.57

CANADA

Pig Iron

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$21.0
No. 2 fdy., sil. 1.75 to 2.75	20.5
Malleable	21.0

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$22.5
No. 2 fdy., sil. 1.75 to 2.25	22.0
Malleable	22.5
Basic	22.0

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

	Per Gross To
Domestic, 80% (carload)	$85.0

Spiegeleisen

	Per Gross Ton Furnac
Domestic, 19 to 21%	$26.0
50-ton lots 3-mo. shipment	24.0
F.o.b. New Orleans	26.0

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$77.5
50% (ton lots)	85.0
75% (carloads)	126.0
75% (ton lots)	136.0

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross To*	
6%	$22.75	12%	$29.5
7%	23.75	13%	30.7
8%	24.75	14%	32.2
9%	25.75	15%	33.7
10%	26.75	16%	35.2
11%	27.75	17%	36.7

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese 2 to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional.

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross To*	
10%	$27.75	14%	$33.25
11%	28.75	15%	34.75
12%	30.25	16%	36.25
13%	31.75	17%	37.75

Manganese 2 to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Other Ferroalloys

Ferrotungsten, per lb. contained W. del., carloads	$1.35 to $1.45
Ferrotungsten, less carloads	1.45 to 1.55
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr. per lb. contained Cr. delivered, in carloads	10.00c.
Ferrochromium, 2% carbon	16.50c. to 17.00c.
Ferrochromium, 1% carbon	17.50c. to 18.00c.
Ferrochromium, 0.10% carbon	19.50c. to 20.00c.
Ferrochromium, 0.06% carbon	20.00c. to 20.50c.
Ferrovanadium, del. per lb. contained V.	$2.70 to $2.90
Ferrocarbontitanium, 15 to 18% Ti, 6 to 8% C, f.o.b. furnace carload and contract per net ton	$137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage	50.00
Ferrophosphorus, electric, 24%, f.o.b. Anniston, Ala., per gross ton with $2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c
Silico spiegel, per ton, f.o.b. furnace, car lots	$38.00
Ton lots or less per ton	45.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	90.00
2% carbon grade	95.00
1% carbon grade	105.00
Spot prices	$5 a ton higher

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.50 to $12.00
No. 2 heavy melting steel	10.00 to 10.50
No. 2 railroad wrought	11.50 to 12.00
Scrap rails	13.00 to 13.50
Rails, 3 ft. and under	13.50 to 14.00
Compressed sheet steel	11.25 to 11.75
Hand bundled sheet steel	10.00 to 10.50
Hvy. steel axle turnings	10.00 to 10.50
Machine shop turnings	8.00 to 8.50
Short shov. turnings	8.00 to 8.50
Short mixed borings and turnings	6.25 to 6.75
Cast iron borings	6.25 to 6.75
Cast iron carwheels	12.00 to 12.50
Heavy breakable cast	11.50 to 12.00
No. 1 cast	13.00 to 13.50
Railr. knuckles and couplers	14.25 to 14.75
Rail. coil and leaf springs	14.25 to 14.75
Rolled steel wheels	14.25 to 14.75
Low phos. billet crops	15.00 to 15.50
Low phos. sheet bar crops	14.25 to 14.75
Low phos. plate scrap	14.00 to 14.50
Low phos. punchings	14.00 to 14.50
Steel car axles	14.25 to 14.75

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton
Heavy melting steel	$10.00 to $10.50
Automobile hvy. melt. steel	9.50 to 10.00
Shoveling steel	10.00 to 10.50
Hydraulic comp. sheets	9.00 to 9.50
Drop forge flashings	8.00 to 8.50
No. 1 busheling	9.25 to 9.75
Rolled carwheels	11.25 to 11.75
Railroad tires	12.25 to 12.75
Railroad leaf springs	11.25 to 11.75
Axle turnings	9.50 to 10.00
Steel couplers and knuckles	11.25 to 11.75
Coil springs	12.50 to 13.00
Axle turnings (elec. fur.)	10.00 to 10.50
Low phos. punchings	13.25 to 13.75
Low phos. plates, 12 in. and under	13.25 to 13.75
Cast iron borings	5.25 to 5.75
Short shoveling turnings	5.25 to 5.75
Machine shop turnings	5.50 to 6.00
Rerolling rails	11.25 to 11.75
Steel rails, less than 3 ft.	11.75 to 12.25
Steel rails, less than 2 ft.	13.25 to 13.75
Angle bars, steel	12.25 to 12.75
Cast iron carwheels	10.75 to 11.25
Railroad malleable	12.25 to 12.75
Agricultural malleable	9.75 to 10.25

	Per Net Ton
Iron car axles	$14.75 to $15.25
Steel car axles	13.25 to 13.75
No. 1 railroad wrought	8.25 to 8.75
No. 2 railroad wrought	9.00 to 9.50
No. 2 busheling	5.25 to 5.75
Locomotive tires, smooth	10.25 to 10.75
Pipe and flues	5.25 to 5.75
No. 1 machinery cast	9.25 to 9.75
Clean automobile cast	8.75 to 9.25
No. 1 railroad cast	8.25 to 8.75
No. 1 agricultural cast	8.25 to 8.75
Stove plate	6.75 to 7.25
Grate bars	6.75 to 7.25
Brake shoes	6.75 to 7.25

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	*$9.50 to $10.50
No. 2 heavy melting steel	*8.50 to 9.50
Hydraulic compressed, new	9.50 to 10.00
Hydraulic compressed, old	7.50 to 8.00
Steel rails for rolling	12.50 to 13.50
Cast iron carwheels	11.00 to 11.50
Heavy breakable cast	10.50 to 11.00
No. 1 cast	11.00 to 11.50
Stove plate (steel works)	8.00 to 8.50
Machine shop turnings	6.00 to 6.50
No. 1 blast furnace	5.00
Heavy axle turnings	9.00 to 9.50
Cast borings	5.00 to 5.50
No. 1 low phos. heavy	13.75 to 14.25
Couplers and knuckles	13.50 to 14.00
Rolled steel wheels	13.50 to 14.00
Steel axles	16.00
Shafting	17.50
No. 1 railroad wrought	10.00 to 10.50
Spec. iron and steel pipe	8.50 to 9.00
No. 1 forge fire	9.50 to 10.00
Cast borings (chem.)	10.50 to 13.00

* Brokers' buying price for export.

CINCINNATI

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.75 to $8.25
No. 2 heavy melting steel	6.25 to 6.75
Scrap rails for melting	7.75 to 8.25
Loose sheet clippings	4.25 to 4.75
Bundled sheets	5.75 to 6.25
Cast iron borings	4.25 to 4.75
Machine shop turnings	4.25 to 4.75
No. 1 busheling	5.75 to 6.25
No. 2 busheling	2.50 to 3.00
Rails for rolling	8.75 to 9.25
No. 1 locomotive tires	7.00 to 7.50
Short rails	11.25 to 11.75
Cast iron carwheels	7.75 to 8.25
No. 1 machinery cast	9.00 to 9.50
No. 1 railroad cast	8.25 to 8.75
Burnt cast	5.75 to 6.25
Stove plate	5.75 to 6.25
Agricultural malleable	7.75 to 8.25
Railroad malleable	8.75 to 9.25

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$9.75 to $10.00
No. 2 heavy melting steel	9.25 to 9.75
Compressed sheet steel	9.25 to 9.75
Light bundled sheet stampings	7.50 to 8.00
Drop forge flashings	8.50 to 9.00
Machine shop turnings	6.50 to 7.00
Short shoveling turnings	6.75 to 7.25
No. 1 busheling	9.00 to 9.50
Steel axle turnings	9.00 to 9.50
Low phos. billet crops	14.00 to 14.50
Cast iron borings	6.75 to 7.25
Mixed borings and short turnings	6.75 to 7.25
No. 2 busheling	6.75 to 7.25
No. 1 cast	12.50 to 13.00
Railroad grate bars	7.00 to 7.50
Stove plate	7.50 to 8.00
Rails under 3 ft.	13.00 to 13.50
Rails for rolling	15.50 to 18.00
Railroad malleable	13.50 to 14.00
Cast iron carwheels	10.75 to 11.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$10.75
No. 2 heavy melting scrap	9.75
Scrap rails	11.00
New hydraul. comp. sheets	9.75
Old hydraul. comp. sheets	8.75
Drop forge flashings	9.75
No. 1 busheling	9.75
Hvy. steel axle turnings	8.50 to 8.50
Machine shop turnings	4.50 to 5.00
Knuckles and couplers	11.50 to 12.00
Coil and leaf springs	11.50 to 12.00
Rolled steel wheels	11.50 to 12.00
Low phos. billet crops	12.00 to 12.50
Short shov. steel turnings	6.00 to 6.50
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
No. 2 busheling	6.50
Steel car axles	11.50 to 12.00
Iron axles	11.50 to 12.00
No. 1 machinery cast	11.50 to 12.50
No. 1 cupola cast	10.50 to 11.00
Stove plate	9.00 to 9.50
Steel rails, 3 ft. and under	12.50 to 13.00
Cast iron carwheels	11.00 to 11.50
Industrial malleable	12.00 to 13.00
Railroad malleable	12.00 to 13.00
Chemical borings	8.00 to 8.50

BOSTON

Dealers' buying prices per gross ton:

*No. 1 heavy melting steel	$8.50 to $8.75
No. 1 heavy melting steel	6.15 to 6.65
*Scrap T rails	8.50 to 8.75
Scrap rails	6.40 to 6.65
*No. 2 steel	7.25 to 7.50
No. 2 steel	5.15 to 5.65
Breakable cast	5.25 to 5.50
Machine shop turnings	1.75 to 2.00
*Machine shop turnings (short)	4.00 to 4.25
Bundled skeleton, long	4.25 to 4.50
Forge flashings	4.25 to 4.50
Shafting	11.75 to 12.00
Steel car axles	11.50 to 12.00
Cast iron borings, chemical	6.50 to 7.00
*Stove plate	6.25 to 6.50

Per gross ton delivered consumers' yards:

Textile cast	$9.00 to $9.50
No. 1 machinery cast	9.00 to 9.50
Stove plate	6.00 to 6.50
Railroad malleable	11.00 to 11.50

* Delivered local army base.

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	*$7.00 to †$8.50
No. 2 heavy melting steel	*5.50 to †7.50
Heavy breakable cast	6.00 to 6.50
No. 1 machinery cast	7.00 to 7.50
No. 2 cast	†6.50
Stove plate	†6.25
Steel car axles	13.50 to 14.00
Shafting	12.75 to 13.00
No. 1 railroad wrought	7.00 to 7.50
No. 1 yard wrought, long	6.00 to 6.50
Spec. iron and steel pipe	4.50 to 5.00
Forge fire	5.50 to 6.00
Rails for rolling	8.50 to 9.00
Short shoveling turnings	2.00 to 2.50
Machine shop turnings	2.00 to 2.50
Cast borings	3.50 to 3.75
No. 1 blast furnace	2.00 to 2.50
Cast borings (chemical)	11.00 to 11.50
Unprepared yard iron and steel	4.00 to 4.50

Per gross ton, delivered local foundries:

No. 1 machinery cast	$10.00
No. 1 hvy. cast (cupola size)	9.00
No. 2 cast	7.50

* For direct car loading only.
† Loading on barge.

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$9.00 to $9.50
Scrap steel rails	10.00 to 10.50
Short shoveling turnings	7.00
Stove plates	7.00
Steel axles	11.50
Iron axles	11.50
No. 1 railroad wrought	7.00
Rails for rolling	12.50
No. 1 cast	10.00 to 10.00
Tramcar wheels	10.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$8.75 to $9.25
No. 1 heavy melting	8.25 to 8.75
No. 2 heavy melting	7.50 to 8.00
No. 1 locomotive tires	9.75 to 10.25
Misc. stand-sec. rails	9.75 to 10.25
Railroad springs	11.00 to 11.50
Bundled sheets	6.00 to 6.50
No. 2 railroad wrought	8.25 to 8.75
No. 1 busheling	5.00 to 5.50
Cast iron borings and shoveling turnings	3.00 to 3.50
Rails for rolling	10.00 to 10.50
Machine shop turnings	2.75 to 3.25
Heavy turnings	5.50 to 6.00
Steel car axles	12.50 to 13.00
Iron car axles	15.00 to 16.00
No. 1 railroad wrought	6.00 to 6.50
Steel rails less than 3 ft.	11.50 to 12.00
Steel angle bars	9.50 to 10.00
Cast iron carwheels	8.00 to 8.50
No. 1 machinery cast	8.50 to 9.00
Railroad malleable	10.50 to 11.00
No. 1 railroad cast	8.00 to 8.50
Stove plate	6.50 to 7.00
Agricult. malleable	8.50 to 9.00

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$7.75 to $8.25
Borings and short turnings	4.50 to 5.00
Long turnings	$4.00 to $4.50
No. 1 machinery cast	11.00 to 11.50
Automotive cast	11.25 to 11.75
Hydraul. comp. sheets	8.25 to 8.75
Stove plate	6.75 to 7.25
New factory busheling	7.00 to 7.50
Old No. 2 busheling	4.25 to 4.75
Sheet clippings	5.25 to 5.75
Flashings	7.25 to 7.75
Low phos. plate scrap	8.00 to 8.50

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$7.00	$7.00
Rails scrap	8.00	8.00
Machine shop turnings	3.00	3.00
Boiler plate	4.50	4.50
Heavy axle turnings	4.50	4.00
Cast borings	4.00	3.50
Steel borings	2.00	2.00
Wrought pipe	3.50	3.50
Steel axles	7.00	8.00
Axles, wrought iron	7.00	8.00
No. 1 machinery cast	9.00	9.00
Stove plate	5.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

ORES, FLUORSPAR, COKE, FUEL, REFRACTORIES

Lake Superior Ores

Delivered Lower Lake Ports

	Per Gross Ton
Old range, Bessemer, 51.50% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi, Bessemer, 51.50% iron	4.65
Mesabi, non-Bessemer, 51.50% iron	.50
High phosphorus, 51.50% iron	4.40

Foreign Ore

C.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algeria	10.50c.
Iron, low phos., Swedish, average 68½% iron	10.50c.
Iron, basic or foundry, Swedish, aver. 65% iron	9.50c.
Iron, basic or foundry, Russian, aver. 65% iron	9.50c.
Manganese, Caucasian, washed 52%	26c.
Manganese, African, Indian, 44-48%	22c.
Manganese, African, Indian, 49-51%	24c.
Manganese, Brazilian, 46 to 48½%	20c.

	Per Net Ton Unit
Tungsten, Chinese, wolframite, duty paid, delivered	$16.00 to $16.50
Tungsten, domestic, scheelite, delivered	16.50

	Per Gross Ton
Chrome, 45% Cr_2O_3, lump, c.i.f. Atlantic Seaboard	$17.50
45 to 46% Cr_2O_3 (Turkish)	$16.00 to 16.50
48% Cr_2O_3	20.50
48% min. Cr_2O_3 (Turkish)	19.25
Chrome concentrate, 50% and over Cr_2O_3, c.i.f. Atlantic Seaboard	22.00
52% Cr_2O_3 (Turkish)	21.75
48 to 49% Cr_2O_3 (Turkish)	19.25

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5, f.o.b. Kentucky and Illinois mines for all-rail shipment	$14.50 to $15.00
Same grade for Ohio River barge shipment for Kentucky and Illinois River landings	16.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	14.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	18.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2¼% silicon, f.o.b. Illinois and Kentucky mines	30.00

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville Prompt	$2.25 to $3.50
Foundry, f.o.b. Connellsville Prompt	4.00 to 5.10
Foundry, by-product, Chicago ovens, for delivery outside switching district	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	11.00
Foundry, by-product, Newark or Jersey City, del'd	9.24 to 9.72
Foundry, by-product, Phila.	9.03
Foundry, by-product, Cleveland, delivered	9.25
Foundry, Birmingham	6.60
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	9.00
Foundry, from Birmingham, f.o.b. cars docks, Pacific ports	14.75

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.45 to $1.65
Mine run coking coal, f.o.b. W. Pa.	1.75 to 1.95
Gas coal, ¾-in., f.o.b. Pa. mines	1.85 to 2.35
Mine run gas coal, f.o.b. Pa. mines	1.75 to 1.95
Steam slack, f.o.b. W. Pa. mines	1.00 to 1.25
Gas slack, f.o.b. W. Pa. mines	1.20 to 1.45

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.25c.
No. 4 industrial	3.87½c.
Per Gal. f.o.b. Baltimore	
No. 3 distillate	4.25c.
No. 4 industrial	3.87½c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	4.75c.
No. 5 industrial fuel oil	3.75c.
Per Gal. f.o.b. Cleveland	
No. 3 distillate	5.50c.
No. 4 industrial	5.25c.
No. 5 industrial	4.25c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	5.00	40.00
New Jersey	50.00 to 55.00	42.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	45.00	40.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$45.00
Chicago District	54.00
Birmingham	55.00
Silica clay, per net ton	8.00

Chrome Brick

	Per Net Ton
Standard, f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	$45.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	45.00

Magnesite Brick

	Per Net Ton
Standard, f.o.b. Baltimore and Chester, Pa.	$65.00
Chemically Bonded, f.o.b. Baltimore	55.00

Grain Magnesite

	Per Net Ton
Imported f.o.b. Baltimore and Chester, Pa.	$45.00
Domestic, f.o.b. Baltimore and Chester	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

Warehouse Prices for Steel Products

PITTSBURGH

Base per Lb.

Plates	3.15c.
Structural shapes	3.15c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.90c.
Cold-finished and screw stock:	
Rounds and hexagons	3.20c.
Squares and flats	3.20c.
Hoops and bands under ¼ in.	3.20c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.30c.
Galv. sheets (No. 24), 25 or more bundles	3.95c.
Hot-rolled sheets (No. 10)	2.95c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.69
Spikes, large	2.90c.
Track bolts, all sizes, per 100 count,	65 per cent off list.
Machine bolts, 100 counts,	65 per cent off list.
Carriage bolts, 100 count,	65 per cent off list.
Nuts, all styles, 100 count,	65 per cent off list.
Large rivets, base per 100 lb.	$3.50
Wire, black, soft ann'l'd, base per 100 lb.	*2.70
Wire, galv. soft, base per 100 lb.	*2.925
Common wire nails, per keg	*2.834
Cement coated nails, per keg	*2.834

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 9999 lb.

*Delivered in Pittsburgh switching district.

CHICAGO

Base per Lb.

Plates and structural shapes	3.20c.
Soft steel bars	3.95c.
Cold-fin. steel bars:	
Rounds and hexagons	3.35c.
Flats and squares	3.35c.
Hot-rolled strip	3.30c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.55c.
Hot-rolled sheets (No. 10)	3.05c.
Spikes (keg lots)	3.50c.
Track bolts (keg lots)	4.65c.
Rivets, structural (keg lots)	3.65c.
Rivets, boiler (keg lots)	3.75c.
	Per Cent Off List
Machine bolts	*70
Carriage bolts	*70
Lag screws	*70
Hot-pressed nuts, sq. tap. or	
Hot-pressed nuts, sq. tap or blank	*70
Hot-pressed nuts, hex. tap or	
Hot-pressed nuts, hex. tap or blank	*70
Hex. head cap screws	87½
Cut point set screws	80
Flat head bright wood screws	50 and 20
Spring cotters	55
Stove bolts in full packages	70
Rd. hd. tank rivets, 7/16 in. and smaller	57½
Wrought washers	$4.50 off list
Black ann'l'd wire per 100 lb.	$3.85
Com. wire nails, base per keg	2.95†
Cement c't'd nails, base per keg	2.95†

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. All prices are f.o.b. consumers' plants within the Chicago switching district.

*These are quotations delivered to city trade for quantities of 100 lb. or more. For lots of less than 100 lb., the quotation is 65 per cent off. Discounts applying to country trade are 70 per cent off, f.o.b., Chicago, with full or partial freight allowed up to 50c. per 100 lb.

†Prices for city and suburbs only.

NEW YORK

Base per Lb.

Plates, ¼ in. and heavier	3.40c.
Structural shapes	3.37c.
Soft steel bars, small shapes	3.26c.
Iron bars	3.26c.
Iron bars, swed, charcoal	6.50c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.81c.
Flats and squares	4.31c.
Cold-rolled; strip, soft and quarter hard	3.36c.
Hoops	3.56c.
Bands	3.56c.
Hot-rolled sheet (No. 10)	3.31c.
Hot-rolled ann'l'd sheets (No. 24*)	3.89c.
Galvanized sheets (No. 24*)	4.50c.
Long terne sheets (No. 24)	5.20c.
Standard tool steel	11.00c.
Wire, black annealed (No. 10)	3.40c.
Wire, galv. (No. 10)	3.75c.
Tire steel, 1 x ⅛ in. and larger	3.65c.
Open hearth spring steel	4.00c. to 10.00c.
Common wire nails, base, per keg	$3.21
	Per Cent
Machine bolts, cut thread:	Off List
All diameters	65 and 10
Carriage bolts, cut thread:	
All diameters	65 and 10

Boiler tubes:	Per 100 Ft.
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

Base per Lb.

Plates and struc. shapes	3.45c.
Bars, soft steel or iron	3.50c.
Cold-fin. rounds, shafting, screw stocks	3.60c.
Hot-rolled annealed sheets (No. 24)	4.10c.
Galv. sheets (No. 24)	4.65c.
Hot-rolled sheets (No. 10)	3.30c.
Black corrug. sheets (No. 24)	4.10c.
*Galv. corrug. sheets	4.65c.
Structural rivets	4.00c.
Boiler rivets	4.10c.
	Per Cent Off List
Tank rivets, 7/16 in. and smaller	55
Machine and carriage bolts, lag screws fittings up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts: All quantities	70

*No. 26 and lighter take special prices.

PHILADELPHIA

Base per Lb.

*Plates, ¼-in. and heavier	2.98c.
*Structural shapes	2.98c.
*Soft steel bars, small shapes, iron bars (except bands)	2.93c.
‡Reinforc. steel bars, sq. twisted and deformed	2.96c.
Cold-finished steel bars	3.61c.
*Steel hoops	3.43c.
*Steel bands, No. 12 and 3/16 in., incl.	3.18c.
Spring steel	5.00c.
†Hot-rolled anneal. sheets (No. 24)	3.65c.
†Galvanized sheets (No. 24)	4.30c.
*Hot-rolled annealed sheets (No. 10	3.08c.
Diam. pat. floor plates, ¼ in.	4.95c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

‡For less than 2000 lb.

CLEVELAND

Base per Lb.

Plates and struc. shapes	3.31c.
Soft steel bars	2.95c.
Reinforc. steel bars	2.10c.
Cold-finished steel bars	3.25c.
Flat-rolled steel under ¼ in.	3.36c.
Cold-finished strip	$3.00c.
Hot-rolled annealed sheets (No. 24)	3.96c.
Galvanized sheets (No. 24)	4.61c.
Hot-rolled sheets (No. 10)	3.11c.
Hot-rolled 3/16 in. 24 to 48 in. wide sheets	3.56c.
Black ann'l'd wire, per 100 lb.	$2.65
No. 9 galv. wire, per 100 lb.	3.00
Com. wire nails, base per keg	2.40

†Outside delivery 10c. less.

CINCINNATI

Base per Lb

Plates and struc. shapes	3.42c.
Bars, soft steel or iron	3.17c.
New billet reinforc. bars	3.25c.
Rail steel reinforc. bars	3.25c.
Hoops and bands, 3/16 in. and lighter	3.47c.
Cold-finished bars	3.57c.
Hot-rolled annealed sheets (No. 24)	4.02c.
Galv. sheets (No. 24)	4.72c.
Hot-rolled sheets (No. 10)	3.22c.
Structural rivets	4.35c.
Small rivets	55 per cent off list
No. 9 ann'l'd wire, per 100 lb. (1000 lb. or over)	$2.88
Com. wire nails, base per keg:	
Any quantity less than carload	3.04
Cement c't'd nails, base 100-lb. keg	3.50
Chain, 1-in., per 100 lb.	8.35
	Net per 100 Ft
Seamless steel boiler tubes, 2-in.	$22.66
4-in.	48.14
Lap-welded steel boiler tubes, 2-in.	19.35
4-in.	45.30

BUFFALO

Base per Lb.

Plates	3.38c.
Struc. shapes	3.25c.
Soft. steel bars	3.00c.
Reinforcing bars	2.60c.
Cold-fin. flats and sq.	3.40c.
Round and hex.	3.40c.
Cold-rolled strip steel	3.19c.
Hot-rolled annealed sheets (No. 24)	4.06c.
Heavy hot-rolled sheets, 3/16 in., 24 to 48 in. wide	3.63c.
Galv. sheets (No. 24)	4.70c.
Bands	3.43c.
Hoops	3.43c.
Heavy hot-rolled sheets	3.18c.
Com. wire nails, base per keg	$3.35
Black wire, base per 100 lb. (2500-lb. lots or under)	3.55
(Over 2500 lb.)	3.45

BOSTON

Base per Lb.

Beams, channels, angles, tees, zees	3.54c.
H beams and shapes	3.54c.
Plates—sheered, tank and univ. mill, ¼ in. thick and heavier	3.56c.
Floor plates, diamond pattern	5.36c.
Bar and bar shapes (mild steel)	3.35c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.65c. to 4.65c.
Half rounds, half ovals, ovals and bevels	4.60c.
Tire steel	4.60c.
Cold-rolled strip steel	3.245c.
Cold-finished rounds, squares and hexagons	3.90c.
Cold-finished flats	3.75c.
Blue annealed sheets, No. 10 ga.	3.65c.
One pass cold-rolled sheets No. 24 ga.	4.20c
Galvanized steel sheets, No. 24 ga.	4.90c.
Lead coated sheets, No. 24 ga.	5.85c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials

DETROIT

Base per Lb.

Soft steel bars	3.04c.
Structural shapes	3.42c.
Plates	3.42c.
Floor plates	5.17c.
Hot-rolled annealed sheets (No. 24)	3.94c.
Hot-rolled sheets (No. 10)	3.14c.
Galvanized sheets (No. 24)	4.72c.
Bands	3.39c.
Hoops	3.39c.
Cold-finished bars	3.49c.
Cold-rolled strip	3.18c.
Hot-rolled alloy steel (S.A.E. 3100 Series)	5.29c.*
Bolts and nuts	70 and 5 per cent off list

Prices delivered by truck in metropolitan Detroit, subject to quantity differentials.

* Price applies to 1,000 lb. and over.

MILWAUKEE

Base per Lb

Plates and structural shapes	3.31c
Soft steel bars	3.06c
Hot-rolled strip	3.41c.
Hot-rolled sheets (No. 10)	3.16c.
Hot-rolled annealed sheets (No. 24)	3.96c.
Galvanized sheets (No. 24)	4.66c
Cold-finished steel bars	3.61c.
Cold-rolled strip	3.30c
Structural rivets (keg lots)	3.86c
Boiler rivets (keg lots)	3.96c.
Track spikes (keg lots)	3.71c.
Track bolts (keg lots)	4.86c.
Black annealed wire	3.10c
Com. wire nails	2.90c
Cement coated nails	2.90c
	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Hot-pressed nuts, sq. and hex., tapped or blank (keg lots)	70

Prices given above are delivered Milwaukee.

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. On galvanized and No. 24 hot-rolled annealed sheets the prices given apply on order of 400 to 3499 lb. On cold-finished bars the prices are for orders of 300 to 499 lb.

ST. PAUL

Base per Lb.

Mild steel bars	3.20c.
Structural shapes	3.45c.
Plates	3.45c.
Cold-finished bars	3.87c.
Bands and hoops	3.55c.
Hot-rolled annealed sheets, No. 24	3.90c.
Galvanized sheets, No. 24	4.50c.
Cold-rolled sheets, No. 20	4.95c.

On mild steel bars, shapes, plates and hoops and bands the base applies on 400 to 14,999 lb. On cold-finished bars, hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over.

BALTIMORE

Base per Lb.

*Mild steel bars	2.95c.
*Iron bars	2.95c.
*Reinforcing bars	2.95c.
*Structural shapes	3.00c.
†Plates	3.00c.
†Hot-rolled sheet, No. 10	3.10c.
Hot-rolled annealed sheets, No. 24	3.60c.
Galvanized sheets, No. 24	4.30c.
*Bands	3.20c.
*Hoops	3.45c.
Cold-rolled rounds	3.58c.
Cold-rolled squares, hex. and flats	3.58c.
Rivets	4.40c.
Bolts and nuts, per cent off list	60 and 10

*Quantity extras per size apply. †Quantity extras per thickness apply. Hot-rolled quantity extras are: 2000 lb. and over, base; 1500 lb. to 1999 lb., add 15c. per 100 lb.; 1000 lb. to 1499 lb., add 30c.; 0 to 999 lb., add 50c.

CHATTANOOGA

Base per Lb.

Mild steel bars	3.31c.
Iron bars	3.31c.
Reinforcing bars	3.31c.
Structural shapes	3.56c.
Plates	3.56c.
Hot-rolled sheets, No. 10	3.36c.
Hot-rolled annealed sheets, No. 24	4.21c.
Galvanized sheets, No. 24	4.86c.
Steel bands	3.61c.
Cold-finished bars	3.98c.

MEMPHIS

Base per Lb.

Mild steel bars	3.41c.
Shapes, bar size	3.41c.
Iron bars	3.41c.
Structural shapes	3.66c.
Plates	3.66c.
Hot-rolled sheets, No. 10	3.46c.
Hot-rolled annealed sheets, No. 24	4.26c.
Galvanized sheets, No. 24	4.96c.
Steel bands	3.71c.
Cold-drawn rounds	3.85c.
Cold-drawn flats, squares, hexagons	6.45c.
Structural rivets	4.25c.
Bolts and nuts, per cent off list	65
Small rivets, per cent off list	50

PACIFIC COAST

Base per Lb.

	San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	3.55c.	3.60c.	3.55c.
Shapes, standard	3.55c.	3.60c.	3.55c.
Soft steel bars	3.60c.	3.60c.	3.60c.
Reinforcing bars, f.o.b. cars dock Pacific ports	2.45c.	2.45c.	2.45c.
Hot-rolled annealed sheets (No. 24)	4.40c.	4.35c.	4.40c.
Hot-rolled sheets (No. 10)	3.75c.	3.70c.	3.75c.
Galv. sheets (No. 24)	5.00c.	4.95c.	5.00c.
Cold finished steel:			
Rounds	5.95c.	5.85c.	6.00c.
Squares and hexagons	7.20c.	7.10c.	7.25c.
Flats	7.70c.	7.60c.	8.25c.
Common wire nails —base per keg less carload	$3.30	$3.40	$3.30

All items subject to differentials for quantity.

TOOL STEEL

Prices are same for warehouse distribution at all points on or East of Mississippi River. West of Mississippi quotations are 1c. a lb. higher.

Base per Lb.

High speed	57c.
High carbon chrome	37c.
Oil hardening	22c
Extra	17c
Regular	14c

Copper Sales Total 56,300 Tons at 8c.—Lead More Quiet But Very Firm

Consumers Purchase 1225 Tons of Spelter; Price Remains Steady—Tin Very Dull as Quotations Move Between Narrow Limits

NEW YORK, July 16.—The threatened price advance on electrolytic copper has failed to materialize. Nevertheless the strong tone during the past week served to force in practically all copper users for commitments totaling over 22,000 tons on Friday and Saturday, and 23,800 tons yesterday. Bookings for the month up to today amount to 56,300 tons. All of the transactions of the past few days have been made at the usual 8c., Connecticut Valley, price level, and delivery dates range from nearby up through October. Activity in the red metal subsided to a considerable extent today, but several producer sellers are well satisfied with their backlogs and are none too willing to entertain additional business at the 8c. level. Outside copper has practically disappeared, although several tonnages are being offered at 8c., with no takers due to the locations and brands. Sharp price advances in London occurred during the week, mostly as a reflection of the activity in this country. Today's price abroad ranged between 7.90c. and 7.95c. a lb., c.i.f. usual Continental base ports, with the latter price considered more representative. Foreign sentiment on copper is very confident, and sales currently are quite heavy.

Tin

Neither buyers nor sellers are showing any inclination to assert themselves. Consequently the market continues almost inactive with little or no tonnage changing hands. Price fluctuations during the week were within narrow limits, with Straits closing today at 52.37½c. a lb., New York, a slight advance over the position of a week ago. Standard tin also showed a slight rise during the week in London. Postings on first call this morning were £232 10s. and £224 5s. for spot and future standard, and £230 10s. for Straits at Singapore. Market operators are daily more concerned over the constantly decreasing visible stocks. At present, these world stocks are 14,380 tons, which is the lowest figure registered during the past seven years. This condition is judged as being very dangerous inasmuch as most of these stocks are in the hands of a single group whose aim is to secure a high selling price rather than supply consumers with their requirements.

Zinc

With steel operations down to a low level and users generally well supplied with spelter, the market is, naturally enough, not very active. Also, sellers show no anxiety for business and are not inclined to force sales with price concessions. Under these conditions, the market price for Prime Western remains steadily at 4.30c. a lb., East St. Louis. Total bookings of all sellers amounted to 1225 tons last week, all at 4.30c. and, for the most part, for nearby delivery. Forward commitments dropped 2000 tons to 24,200 tons during the week. Total sales of Prime Western during June amounted to 3543 tons at a weighted average price of 4.301c. a lb. June bookings for subsequent delivery amounted to 3035 tons at a weighted selling price of 4.298c. a lb.

Lead

All sellers are in a very comfortable position as a result of a sustained demand from users since the first of the month. Although activity has quieted down in the past several days, sellers are far from anxious for business and consider the outlook as very promising. Consequently the price is steady on a 4.15c., New York, basis, with no indication of weakness. On the other hand, if consumer demands are insistent when buying resumes during the next fortnight, it is quite possible that quotations may be lifted a few points. The estimated July requirements of users are judged as being almost fully covered, and August is considered slightly more than 50 per cent booked.

The Week's Prices. Cents Per Pound for Early Delivery

	July 10	July 11	July 12	July 13	July 15	July 16
Electrolytic copper, N. Y.*	7.75	7.75	7.75	7.75	7.75	7.75
Lake copper, N. Y.	8.12½	8.12½	8.12½	8.12½	8.12½	8.12½
Straits tin, spot, New York	52.20	52.20	52.10	....	52.25	52.37½
Zinc, East St. Louis	4.30	4.30	4.30	4.30	4.30	4.30
Zinc, New York†	4.67½	4.67½	4.67½	4.67½	4.67½	4.67½
Lead, St. Louis	4.00	4.00	4.00	4.00	4.00	4.00
Lead, New York	4.15	4.15	4.15	4.15	4.15	4.15

*Refinery quotations; price ¼c. higher delivered in Connecticut.
†Includes emergency freight charge.

Aluminum, virgin 99 per cent plus, 19c. to 21c. a lb., delivered.
Aluminum, No. 12 remelt, No. 2 standard, in carloads, 16.25c. a lb., delivered.
Nickel, electrolytic, 35c. to 36c. a lb. base refinery, in lots of 2 tons or more.
Antimony, Asiatic, 12.75c. a lb., New York.
Brass ingots, commercial 85-5-5-5, 8c. a lb., delivered; in Middle West ¼c. a lb. is added on orders for less than 40,000 lb.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	53.25c. to 54.25c.
Tin, bar	55.25c. to 56.25c.
Copper, Lake	9.00c. to 10.00c.
Copper, electrolytic	9.00c. to 9.50c.
Copper, castings	8.75c. to 9.75c.
*Copper sheets, hot-rolled	15.00c.
*High brass sheets	13.62½c.
*Seamless brass tubes	15.37½c.
*Seamless copper tubes	15.25c.
*Brass rods	12.12½c.
Zinc, slabs	5.75c. to 6.75c.
Zinc, sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	4.62½c. to 5.62½c.
Lead, bar	5.62½c. to 6.62½c.
Lead, sheets	7.75c.
Antimony, Asiatic	13.50c. to 14.50c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	29.50c. to 30.50c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	56.00c.
Tin, bar	58.00c.
Copper, Lake	9.00c.
Copper, electrolytic	9.00c.
Copper, castings	8.25c.
Zinc, slabs	5.85c. to 6.10c.
Lead, American pig	4.65c. to 5.00c.
Lead, bar	5.00c.
Antimony, Asiatic	15.00c.
Babbitt metal, medium grade	19.25c.
Babbitt metal, high grade	60.00c.
Solder, ½ and ½	32.75c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	5.62½c.	6.37½c.
Copper, hvy. and wire	5.50c.	6.00c.
Copper, light and bottoms	4.50c.	5.00c.
Brass, heavy	3.00c.	3.62½c.
Brass, light	2.25c.	3.00c.
Hvy. machine composition	4.87½c.	5.37½c.
No. 1 yel. brass turnings	4.00c.	4.50c.
No. 1 red brass or compos. turnings	4.25c.	4.75c.
Lead, heavy	2.87½c.	3.25c.
Zinc	2.25c.	2.62½c.
Cast aluminum	10.62½c.	11.75c.
Sheet aluminum	12.00c.	13.50c.

Cleveland Steel Output Is Three Points Higher

Steel Bars and Structural Shapes More Active — Automotive Demand Continues—Scrap Prices Higher

CLEVELAND, July 16.—New business in finished steel improved during the past week, and the ingot output in the Cleveland-Lorain territory has been stepped up three points to 35 per cent of capacity by the starting of an additional open-hearth furnace in Lorain. The gain in activity is largely in steel bars and structural shapes. Additional steel bar requirements of the automotive industry for present models brought out some new bar tonnage, and miscellaneous business is fair.

Motor car builders continue to purchase small lots of sheets both for present and new models and have placed some orders for stampings for 1936 cars. Releases for stamped parts for new models are not expected before September. Forge shops are now figuring on numerous inquiries for parts for new models.

New inquiry in the construction field is slack. The State of Ohio, which has placed little highway and bridge work for several months, has announced that it will resume these activities in September, when inquiries are expected to be sent out for bridges requiring sizable lots of structural steel.

The Chesapeake & Ohio Railroad has placed five high-speed passenger locomotives with the Lima Locomotive Works. The steel and parts, approximately 250 tons, will be allocated among several manufacturers. While this road inquired for 20 additional tenders, it is stated that these will not be purchased.

With reduced production of scrap, the supply is not overly plentiful in this territory, giving the market a firmer undertone, and prices have been marked up 25c. to 50c. a ton.

Pig Iron

Shipments, which started in July at about the same rate as in June, have dropped about 15 per cent from last month. Sales are holding close to recent volume. One producer sold 3000 tons during the week in lots of from carloads to 200 tons. Consumers are carrying little iron in stock and orders usually are accompanied by requests for quick shipment. Complaints are coming from some foundries that competitive conditions are resulting in low prices on gray iron castings.

Sheets

Automobile manufacturers have placed contracts for parts for new models with some of the stamping plants in this territory but releases against these orders are not expected for several weeks. Small lot orders are coming from the car builders, both for present and for new models. Demand from stove manufacturers is well maintained. However, little business is coming from makers of other household equipment. The local sheet mill is scheduled for 65 per cent operation this week. The Monroe, Mich., mill is shut down for the week.

Strip Steel

Specifications in rather light volume are coming from motor car and parts manufacturers and there is little new business from any source. The local cold-rolled strip mill is operating this week at 35 per cent of capacity, a ten point reduction from last week.

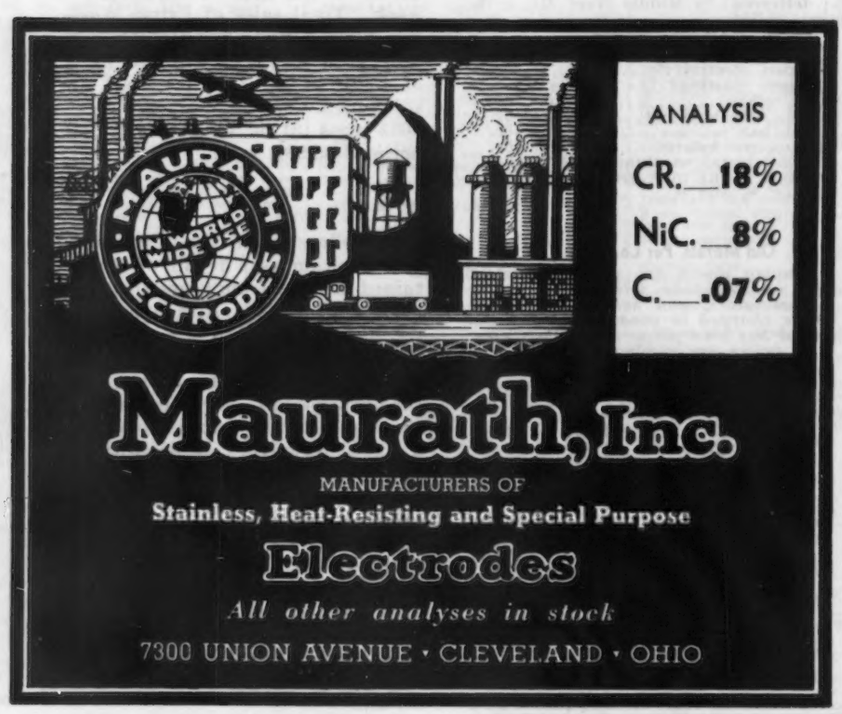
Iron Ore

The amount of ore used in making a ton of iron and steel has shown a slight upturn for two years. In 1934 0.77 tons of Lake Superior ore was consumed for every ton of iron and steel produced according to figures just compiled. The proportion of iron consumed is usually cut down by the use of scrap during periods of depression. In 1892 only 0.68 tons of Lake Superior ore was consumed per ton of iron and steel produced and in 1933 this was increased to 0.72 tons. In 1925 and 1926 there was 1.03 tons of lake ore consumed for every ton of iron and steel produced.

Receipts of Lake Superior ore at lower lake docks during June were 3,001,735 tons, a decrease of 115,914 tons from the same month last year. Receipts for the season until July 1 were 5,328,967 tons, a gain of 743,727 tons as compared with the same period a year ago. Shipments from these docks during June were 2,202,576 tons and for the season until July 1, 4,342,546 tons as against 4,107,530 tons for the same period last year. Dock balance July 1 was 4,160,873 tons as compared with 4,342,996 tons on the same date a year ago.

Bolts, Nuts and Rivets

The volume of business this month is about the same as in June



when the absence of orders from the automobile manufacturers caused considerable slump. Some good sized inquiries have been issued by the Navy Department for bolts up to ¾ in. in diameter and for machine screws for construction of new boats and navy yard stocks.

Bars, Plates and Shapes

Bar orders gained moderately in the past week. Some unexpected tonnage came from automobile parts fabricators who secured additional releases for parts for current models, and small miscellaneous orders were fair. The Mt. Vernon Bridge Co. was low bidder on 11 railroad bridges requiring 2100 tons of structural shapes that will be built in relocation of tracks for the Muskingum Conservancy District. The American Rolling Mill Co. has placed a cold sheet mill building, requiring 1800 tons, with the Ingalls Iron Works Co. A Cleveland contractor has been awarded the Pleasant Hill dam in the Muskingum Conservancy District, requiring 500 tons of reinforcing bars. The two Cleveland housing projects, for which the Government will take bids in August, will call for approximately 2000 tons of reinforcing bars.

Scrap

The market is firmer with advances of 25c. a ton on heavy melting steel and blast furnace scrap and 25c. to 50c. a ton on some other grades. The only new consumer purchase reported is a small tonnage of short shoveling turnings taken by a Cleveland steel plant at $7.25. Cast iron car wheels sold by the New York Central Railroad brought $12.25. Dealers are paying $11.75 to $12 for No. 1 heavy melting steel for Youngstown delivery, an advance of 50 cents a ton. Compressed bundles are bringing $12.25 to $12.50 for Steubenville delivery.

Boston Scrap Market Less Active

BOSTON, July 16.—The local and Providence export scrap markets are less active as shippers, and with one exception, have completed all cargo contracts. A part cargo of textile machinery cast and No. 2 steel will shortly be loaded at Providence. Despite the slump in business, prices for Nos. 1 and 2 steel for export and scrap rails are firmer following a temporary setback. Sentiment in the market for shipment to the Pittsburgh district is more optimistic, although actual transactions are almost nil and prices in most cases unchanged. The market for steel turnings and bundled skeleton, however, continues weak. The American Steel & Wire Co., Worcester, Mass., is still out of the market for scrap, but a Rhode Island mill is paying $8 a ton delivered for No. 1 steel.

Hot weather the past week cut down the New England melt of pig iron considerably, and foundries displayed almost no interest in furnace offerings. In fact, the pig iron market was quieter than in any similar period this year.

Reinforcing steel bar interests have abandoned the national code.

WYCKOFF COLD DRAWN BARS

The Logical Specification ALWAYS for Rapid, Accurate, Automatic Screw Machine Production

Logical because WYCKOFF Cold Drawn Bars are always uniformly machinable, unvarying in cross section and exact in size . . . every length is straight and true to your specification—with physical characteristics as constant as a laboratory formula.

Readily available in Rounds 3/16" to 6" inclusive . . . Squares 1/4 to 4" inclusive . . . Hexagons 1/4" to 3" inclusive . . . Flats 1/8" x 3/8" x 2" x 6" inclusive both in carbon and alloy grades.

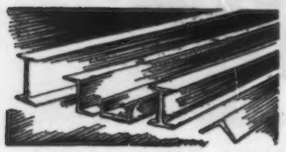
WYCKOFF DRAWN STEEL CO.

General Offices: First National Bank Bldg., Pittsburgh, Pa.
Mills at Ambridge, Pa. and Chicago, Ill.
Manufacturers of Cold Drawn Steels
Turned and Polished Shafting Turned and Ground Shafting

Scrap Quotations Higher at Detroit

DETROIT, July 16.—Prices of heavy melting steel and hydraulic bundles have risen 25c. a ton, sheet clippings, 50c. and other scrap items, 25c. to 50c. The general advance is due partly to purchases by dealers to cover recent orders at Youngstown and Canton, Ohio, and partly to willingness of the local mill to pay slightly higher prices.

Philadelphia Sellers Foresee Heavier Demand in August



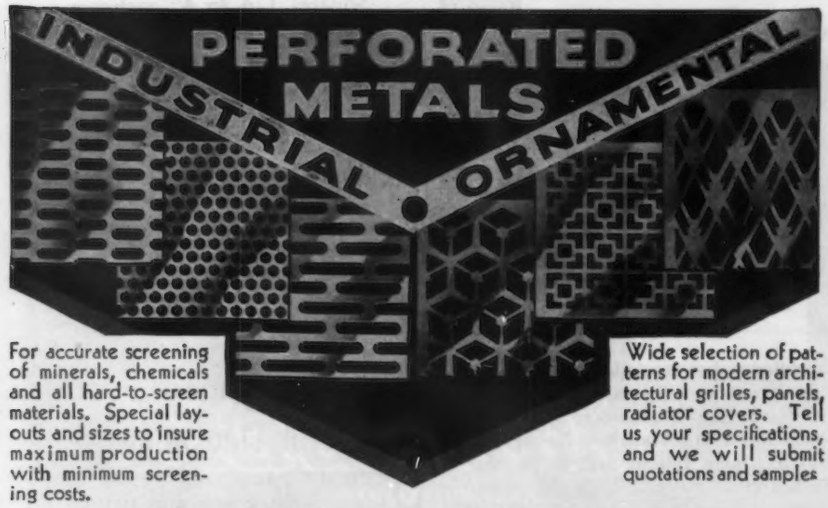
Operating Rate Holds at 27 Per Cent —Scrap Tone Is Very Strong—Barrel Companies Change Hands

PHILADELPHIA, July 16.—Neither jobbers nor fabricators in this area currently have normal inventories, and steel sellers insist that heavier buying must develop during the next month or six weeks. In fact, most mill representatives consider the present situation much more encouraging than it was last year when all users had bought forward heavily in order to escape price advances. All quotations in this area are holding fairly well, and buyers for the most part are not expecting any significant lowering of quotations.

Central Iron & Steel Co. has taken off one of its two active open-hearths, but this change has not altered the district operating rate, which remains at 27 per cent of capacity. All other mills in this area are melting in a volume unchanged from a week ago. It is probable that operations will not show much change over the next few weeks, but a steady climb upward is expected to begin sometime in August. This opinion of steel operators gains credence from the steady strength in scrap, which is usually a reliable forecaster of better steel operations.

The Heintz Mfg. Co. has sold its beer barrel patents and equipment to the John Wood Mfg. Co., Conshohocken, Pa. Likewise, the Wackman Weld Ware Co., Chester, Pa., has purchased the steel drum business of H. H. Ward. The removal of the steel barrel business of an Oil City, Pa., maker to this city has been temporarily abandoned.

Jobbers of pipe and other steel products continue to shade prices here in some instances. These bids are occasionally withdrawn or revised at the suggestion of mills supplying steel to the jobber.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For accurate screening of minerals, chemicals and all hard-to-screen materials. Special layouts and sizes to insure maximum production with minimum screening costs.
Wide selection of patterns for modern architectural grilles, panels, radiator covers. Tell us your specifications, and we will submit quotations and samples

ANY METAL ANY PERFORATION

The Harrington & King PERFORATING Co.

5657 FILLMORE STREET - CHICAGO, ILLINOIS

Pig Iron

Although they are not pressing for price concessions, foundries continue to restrict ordering to small lots required for immediate melting. Aggregate July bookings are, however, holding up to a better level than furnace representatives had expected. Total sales so far this month amount to about 4500 tons, as compared with a total of about 11,000 tons in June and an estimated 8000 tons in May. Current sales are confined almost entirely to foundry grades, with practically no new tonnages moving into steel-mill consumption. No seller is taking fourth quarter commitments, but books will be opened in another month for delivery for that period. No price advance is impending, but, on the other hand, there is little possibility of a decline inasmuch as furnaces are now absorbing higher freight tariffs and higher wages and are faced with increased taxation.

Sheets and Strip

Sellers expect the present inactivity to continue until early August, at which time a steady pickup in demand is anticipated. By that time auto body stamping plants will be in the market for fall supplies and oil storage tank fabricators will advance their purchases of blue-annealed sheets. Local stove makers are expected soon to throw off their protracted lethargy. At present they are just completing their inventory taking and are preparing new stove models for winter sales. Small mixed carlots of strip are going to radio makers, but this commodity is far from satisfactorily active. Tin plate continues to be in fair demand from makers of novelty cans, etc.

Imports

The following iron and steel imports were received here last week: 119 tons of steel bars, 103 tons of steel tubes and 24 tons of steel wire from Sweden, and 96 tons of steel bars, 24 tons of structural shapes, 14 tons of steel bands, 4 tons of band iron and 2 tons of hoop steel from Belgium.

Bars, Plates and Shapes

McClintic-Marshall Corpn. will furnish 800 tons of shapes for a Viscose Co. building at Meadville, Pa., and 1650 tons for an Acacia Life Insurance Co. building at Washington. Also, Reading Steel Products Co. has been awarded 100 tons for a Beneficial Loan Society office building in Philadelphia. No new business in shapes has developed during the week, but over 12,000 tons is still active. The market for plates continues excep-

tionally quiet, the only new project being a standpipe at Quakertown, Pa., which will require 110 tons. Reinforcing bars are very quiet, and the only project now active will require 2600 tons of piling for a jetty in the Wilmington, Del., harbor. The possibility of Federal allotments for highway construction is becoming more encouraging each day. Nevertheless, mills in this area do not expect to receive the benefit of this spending before September.

Scrap

In the face of light mill operations, scrap continues to strengthen each day. Sellers base their bullish position on the widespread underbought position of district mills, the apparent scarcity of steel in the immediate Philadelphia area and the heavy export tonnages which will leave this port in July. It is very probable that heavy melting steel will register a 50c. advance during the next month. Worth Steel is not securing much No. 1 on its current offer of $10 a ton delivered. Pencoyd has raised its offer for No. 2 auto scrap to $9.25, delivered direct from dealers, thereby mirroring the current strength in No. 2 steel. Alan Wood recently purchased a good quantity of blast furnace scrap for $5 a ton, delivered to its Swedeland, Pa., furnace. Central has stopped deliveries on all steel scrap contracts. Local brokers continue to buy No. 1 and No. 2 steel at the pier at unchanged price levels. An English and a Japanese boat are now loading, and several more vessels are expected in before the end of the month. Mitsui recently took a boat load of steel scrap from Trenton.

Steel Production Up at Buffalo

BUFFALO, July 16.—Seven furnaces are being operated by Bethlehem's Lackawanna plant and one more is expected to be placed in operation before the close of the week. Only six furnaces were active last week. Improvement has also taken place at Republic's Buffalo plant where four furnaces are now active. One furnace is being maintained at Wickwire-Spencer Steel Co., and Seneca sheet division of Bethlehem which was operating around 60 per cent is diminishing operations, being down to 50 per cent. This operation is looked upon as comparatively satisfactory, and is an indication that fall activity will be ahead of last year's.

While fabricators of structural steel and reinforcing bars see an opportunity for considerable business in the area of New York damaged by the recent disastrous floods, no new business has come through from this source, though indications are that with a free flow of FERA money, new bridges will be bid sooner than in other cases of emergency.

A marked improvement has taken place in the market for old material and considerable underlying strength is shown. Recent sales of railroad scrap show a trend to higher prices, apparently reflecting an early fall pickup in business. While scrap is being brought in steadily from upper Lake ports, operation has been such since spring, that mills have been unable to assemble the customary large stockpiles. Some small sales of No. 1 machine cast scrap, stove plate and kindred grades have been made at the quoted prices. A large mill is still offering $10.50 for No. 1 heavy melting steel, but is getting very little scrap.

On The Job 42% More

A year ago a prominent commercial forge shop (name on request) installed a Type M ERIE motor-driven board drop hammer, and a competing make of hammer of the same size in order to make a comparative test as a guide for future purchases. Working conditions were made identical; and work, dies, and operators, were shifted from one hammer to another.

A report on the test, now submitted, shows the ERIE hammer has operated 42% more than its competitor. Figures on production and die life, while interesting, are insignificant beside the fact that the ERIE hammer was on the job, in running condition, nearly 50% more than the other. Note, too, that the comparison was not made with an old hammer or one of obsolete design, but with a brand new hammer of the latest type.

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ERIE

Railroad Activity Helps New York Steel Market

General Demand Well Sustained Though Imports Are Becoming More Disturbing Factor—Tin Plate Specifications Good

NEW YORK, July 16.—New inquiry and buying by the railroads is probably the feature of this market, although miscellaneous demand for finished steel is keeping up at about the same rate which prevailed during June. The releases of can makers have picked up somewhat despite the expectation of a quiet July. Steel warehouses are beginning to come into the market for the first time since the collapse of the code, but foreign competition is an increasingly disturbing factor in this business.

The railroad car builders which shared in the recent order of the Chesapeake & Ohio have allocated a large part of the steel required. Chicago mills benefited particularly from this order. The Chesapeake & Ohio has also ordered five locomotives from the Lima Locomotive Works and the Canadian National is in the market for 16 locomotives.

The Seabord Air Line has asked for prices on 12,000 tons of rails and the required accessories and the Chesapeake & Ohio will soon buy 4000 tons. Norfolk & Southern will take bids July 22 on 500 steel box cars. The New York Central has delayed placing its quarterly requirements because of price discrepancies in bids which are believed to be errors on the part of producers.

The week's structural awards include 2330 tons for the New York approach to the Midtown tunnel at New York, 1150 tons for a store and theater building in Times Square, 1100 tons for a high school on Staten Island, N. Y., and 890 tons for a grade crossing elimination at Port Richmond, N. Y. Fabricators' bids are tending lower and seem to allow scarcely any profit at the scheduled price on plain material. The floods in central New York State washed out a number of bridges for which rush replacement orders are appearing.

Tin plate specifications last week were an agreeable surprise to most sellers. The can companies apparently underestimated their July needs in some instances, and crop reports continue to be more favorable.

Imports of finished steel in the district are becoming a constantly more disturbing factor. With the price uncertainty which followed the passing of the code, the situation is even more serious than had been anticipated. Bars, structural shapes and strip steel are the most troublesome products.

Pig Iron

New business continues spotty and unproportionally spread among principal sellers. Total bookings for the entire district amounted to 1350 tons last week, as compared with 2550 tons in the preceding period and 2200 tons sold in the seven-day period a fortnight ago. Current commitments for the most part are for July and August delivery, but some foundries are showing more interest in September supplies. Domestic iron prices are quite firm, with no indications of shading even in differentials.

Reinforcing Steel

Kalman Steel Corpn. will furnish 1400 tons for the approach to the midtown tunnel, New York, and 150 tons for a school at Olean, N. Y. Concrete Steel Co. has been awarded 135 tons for a dam project at Hartford, Conn. Pending projects include 1500 tons for a grade crossing on Staten Island, N. Y., 850 tons for a sewage disposal plant on Ward's Island, N. Y., and 125 tons for a sewage project at Elizabeth, N. J.

Scrap

There is a distinctly better feeling in this market as a reflection of the improved tone in Philadelphia and Pittsburgh. Although no price advances are impending, at least the uncertainty in the price structure of several weeks ago has been removed. Local brokers continue to purchase No. 1, No. 2, stove plate and cast grades for export. No. 2 steel is going to Philadelphia as a result of the unbalanced demand for that grade in eastern Pennsylvania. Also, Pittsburgh continues to take turnings from this area. Although brokers are loading as heavily as ever on old export accounts, export backlogs are diminishing because of the absence of new foreign purchases. Japan continues out of the market, and new Italian buying is being held up in some cases due to credit difficulties. The financial embarrassments of the latter country are accumulating. Welsh exporters of coal to Italy are refusing to extend any more credit and it is possible that this same situation may soon apply to scrap purchases in this country.

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Implement Trade Active at St. Louis

ST. LOUIS, July 16.—The melt of pig iron in the St. Louis territory has been accelerated somewhat by the activities of the agricultural implement interests, those in the Tri-Cities having added night shifts to take care of increased business, when it had been expected that there would be a tapering off in production during July. It is understood that 2000 men have been added to the payrolls as a result of the improved conditions.

The stove trade is experiencing better business than is expected at this time, and in Belleville and districts further north in Illinois preparations are being made for a heavy fall production. The jobbing foundries here and elsewhere in the district report better orders, but a recession in the washing-machine business is reported.

Shipments of pig iron show a marked improvement, but buying is confined almost entirely to spot business, very few contracts being closed.

The movement of finished iron and steel has slowed up somewhat. There still is considerable movement of bale ties and fencing. Lock No. 13 in the Mississippi River at Clinton, Iowa, will require 935 tons of structural steel and 600 tons of reinforcing bars.

The warehouse prices on cold-finished rounds, shafting and screw stock have been reduced from 3.75c. a lb. to 3.60c.

A district mill has bought a round tonnage of scrap specialties and some melting steel. Prices are unchanged. The Missouri-Kansas-Texas has a list of approximately 1000 tons of scrap.

Sheet Demand Is Strong at Cincinnati

CINCINNATI, July 16.—Demand for sheets exceeds mill expectations. Under normal conditions the seasonal recession generally reduces operations to 30 to 40 per cent of capacity output, but orders in the past week were at about 50 to 55 per cent of capacity. Automotive demand has shrunk to about 20 per cent of bookings, the bulk of business being for experimental work on new models. Miscellaneous ordering, however, is heavy with galvanized sheets prominent on current lists. Mill operations are being held close to demand because of prompt shipment requirements.

With virtually all interested consumers covered for third quarter, pig iron demand has receded to a weekly average of about 800 tons. This represents immediate requirements of melters and is for prompt shipment. An analysis of contracts reveals that only a small portion of second quarter commitments was rewritten and in most of these instances additional tonnage was ordered.

Southern iron is profiting from the general market uptrend, bookings in the past week having totaled about 400 tons. Of this, 150 tons in one lot was from a central Indiana purchaser. Foundry operations are averaging about 40 per cent of capacity. Most prominent activity is noticed among stove and automotive melters, although machine tool foundries are becoming a factor in the weekly averages. Prices are steady.

Mill inventories of old materials, estimated to represent about two months' needs, retard efforts of dealers to obtain new commitments. Current business is small.

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July Steel Bookings in Valleys Running Ahead of Corresponding June Orders

YOUNGSTOWN, July 15.—Bookings of finished steel in the first half of July are running moderately ahead of business in the like period of June. This record is considered unusual in view of the holiday week and the season. Indications are appearing, however, of a reversal in the trend of steel activity in the current week, and producers here are planning to schedule open-hearth output lower.

The moderation in activity has been fostered by shrinkage in miscellaneous steel orders. Moreover, automobile tonnage, while surprisingly good for the season, is reflecting the tapering requirements for current models. Only a few small trial lots of steel have been placed here for 1936 models, and not much further assistance is expected from automotive centers until next month.

A fair measure of support to Valley activity is continuing to come from the tin plate market. The Republic Steel Corpn.'s tin mills at Warren have been operating at virtual capacity since the holiday shutdown two weeks ago, while the American Sheet & Tin Plate Co. will operate 15 turns, or at normal capacity, at the Shenango plant. Specifications from the can makers are appearing in satisfactory volume, although they are not keeping pace with the favorable crop reports from certain areas. The first corn and tomato crops in the Southwest and Middle West are expected to be harvested and ready for packing soon, but the tardiness of crops in general this season is breeding caution in some packing centers. The damage to the pea crop, which has been affected by lice, is believed to be small, since most of the early peas have already reached packing centers.

Flat-rolled steel production is holding its own, with sheet and strip mills running at 35 to 40 per cent and with an independent mill scheduled at 45 per cent. Hot-rolled bar mills are slower, while pipe units are only intermittently engaged. The Republic plate mill, which is operating chiefly on pipe skelp for integrated consumption, is on a reduced schedule.

The allotment of $3,000,000 last week by the Federal Housing Administration for slum elimination at Youngstown portends a substantial demand for certain items of steel. Eighty homes are planned for construction. Demand for standard pipe should be measurable.

The renewed pressure for lower steel prices by a leading automobile producer is getting a cold reception from Valley steel producers, who are attempting to maintain all current base quotations and extras. The latest attempt is reported to be an inquiry for nearly 100,000 tons of steel, which evidently is purported to tempt sellers to shade current prices. The maintaining of the present wage scale, the moderate rate of current production and the ominous question of Federal and State taxes are believed here to be sufficient barriers against a cracking of the steel price structure.

The scrap market is sentimentally strong. Indicative of the optimistic outlook for scrap is the reported refusal of the Erie Railroad and the New York Central Railroad to dispose of old material on recent lists. Both of those carriers are reported to be awaiting higher scrap prices before disposition will be made. Dealers with orders placed recently by a leading independent mill are not covering with unusual freedom, and, in some instances, are being forced to operate on an extremely slim margin. The pig iron market is colorless.

Steel Output Rises At Birmingham

BIRMINGHAM, July 16.—Pig iron melters and steel buyers continue on a cautious basis, ordering new material only as needed. There is a fair flow of daily business, but the volume of forward tonnage on the books of the producers is comparatively small. Buyers who have been awaiting price recessions have not had any encouragement as all quotations have been firm.

Six blast furnaces are operating, no change in number having taken place since July 1, when Republic Steel blew out one of its two stacks. On July 10 Sloss-Sheffield blew out its No. 1 furnace for repairs, but on the same day blew in No. 2 furnace.

An additional open-hearth was placed in operation toward the end of last week by the Tennessee Coal, Iron & Railroad Co., and seven units are now active. The same number is scheduled for the current week.

Ingalls Iron Works has booked 2000 tons of structural steel from the American Rolling Mill Co., part of which will be fabricated at its Birmingham plant and part at Verona, Pa. Virginia Bridge & Iron Co. has booked 125 tons for a bridge in Birmingham. Southern Steel Works is to furnish 125 tons for the new municipal auditorium in Gadsden, Ala.

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PERSONALS

WILLIAM L. BATT, president, SKF Industries, Inc., Philadelphia, whose nomination for the office of president of the American Society of Mechanical Engineers was announced in THE IRON AGE of July 4, was born in Salem, Ind., in 1885. Soon after graduation from

W. L. BATT

Purdue University in 1907, he became associated with the Hess-Bright Mfg. Co., Philadelphia, in manufacturing, engineering and sales of anti-friction bearings, and in 1917 became general manager. Following the consolidation of the SKF Ball Bearing Co., Hess-Bright Mfg. Co. and other organizations, Mr. Batt was made vice-president and in 1922 president of SKF Industries, Inc., the central organization. He is also a director of the Air Preheater Corpn. and of the Hudson Insurance Co., New York.

A member of the American Society of Mechanical Engineers since 1911, Mr. Batt has served as chairman of a large number of committees and is at present a vice-president. He has also been active in the Society of Automotive Engineers. From 1923-1926 Mr. Batt served as a director of the Swedish Chamber of Commerce of the United States and in 1926 was elected vice-president of the organization. For his activity in promoting commercial relations with Sweden, King Gustav V conferred upon Mr. Batt in 1926 the decoration of the Order of Vasa and in 1933 the Royal Order of the North Star. In 1933 he was also honored by Purdue University with the degree of Doctor of Engineering.

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JAMES J. ZIMMERMAN has been appointed works manager of the Osborn Machine Co., DuBois, Pa. He formerly served as production manager for the Elliott Co., Jeannette, Pa.; assistant general superintendent of the Scott foundry of the Reading Iron Co., Reading, Pa., and in various capacities with the former Cambria Steel Co., Johnstown, Pa.

❖ ❖ ❖

ARTHUR F. HEBARD, heretofore industrial consultant, 420 Lexington Avenue, New York, has been elected executive vice-president of the Dardelet Threadlock Corpn., New York. After graduation from Williams College, in 1900, he became identified with the Remington Arms Co., and through a series of promotions became general sales manager. He resigned that position in 1917 to go into the service and eventually received the rank of Lt. Colonel in the Ordnance Reserve Corps. From 1919 to 1921 he was vice-president of the Savage Arms Corpn. and was vice-president and general manager of the Noiseless Typewriter Co. until its merger with the Remington Typewriter Co. For the next two years he was vice-president in charge of sales of the Gorham Mfg. Co. and the Gorham Co.

A. F. HEBARD

❖ ❖ ❖

ELMER H. FLINN, formerly treasurer and general manager of Alloy Metal Wire Co., Moore, Pa., has been made supervisor of wire sales by the Ludlum Steel Co., Watervliet, N. Y.

❖ ❖ ❖

P. L. PRICE, for many years treasurer and general manager of Irving Iron Works Co., New York, has been appointed general manager and assistant treasurer of the George A. Just Co., New York. He will make his headquarters at the New York plant, 44-60 Vernon Boulevard, Long Island City.

❖ ❖ ❖

A. S. AULT, formerly ceramic control engineer for the General Electric Co. at Erie, Pa., and with the Frigidaire Corpn. at Dayton, Ohio, has been appointed control engineer in charge of ceramics in the new plumbing ware division of the Briggs Mfg. Co. at Detroit. He is a graduate of Ohio State University.

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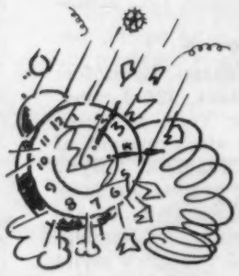

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ROXALIN Flexible FINISHES

CELLULOSE & SYNTHETIC TYPES ENGINEERED FOR SPECIFIC PERFORMANCE

Increased Light Values Obtained With White Paint

(CONTINUED FROM PAGE 35)

that with outside conditions as nearly identical as possible, the working light at 5:00 p. m. after painting was more than 100 per cent better than at 4:00 p. m. before painting. At 5:10 p. m. on March 12, a reading taken at a point where light reflection was an important factor the sight-meter showed a reading of 15 foot-candles on the working plane as compared to 5 foot-candles prior to painting.

What applies to the monitor construction applies just as much to the saw-tooth type and flat ceiling. The flat-type ceiling is perhaps the most commonly encountered and the most dependent upon high reflection values of walls and ceilings. Structural changes in these buildings are often impossible or impracticable. Not only does painting them with white paint increase the level of light over the working plane, but it provides a greater uniformity of light, by a proportionately greater increase in more obscure areas, thus avoiding sharp contrasts of dark and light and especially glaring brightness, which is destructive of good vision. In general, it is a good practice to set a ratio not exceeding three to one as between maximum and minimum daylight.

Another important observation made at the American Stove plant was the effect of an accumulation of dirt on glass windows. Conditions vary according to the industry, but ordinarily a two months' accumulation of dirt will be found to reduce the light entering by about 25 per cent. Six months' accumulation will bring the daylight down to less than half the original light. If the windows are on a slope, as is frequently the case in saw-tooth factories, the effect of dirt on the glass is even greater. About 75 per cent of the dirt commonly gathers on the inside of the windows and the accumulation is much worse in winter than in summer because of the more marked difference in the temperature of the glass and plant interior. Here again the value of white paint in maintaining the highest possible level and maximum distribution of light is shown.

In general, it is found that in a building lighted from sidewalls only, the area of the windows should not be less than 30 per cent of the floor area for a minimum of 10 foot-candles. Also, that this minimum level of illumination will be carried into a building for a distance about three times the height of the window itself. Thus a win- 10 ft. high can be expected to produce 10-foot-candles of light not more than 30 ft. in from the wall. This obviously limits the total width of a building having sidewall windows to 60 ft. Where buildings are made wider than 60 ft. the practice is to place machines and workers dependent upon a high

degree of visibility parallel to the windows and use center portions for stock or passageways. In some cases it is possible to install skylights, or adopt the monitor or sawtooth construction, thus overcoming appreciable drops in the level of light.

The upper portion of the window is the part that throws the light back into the building where natural illumination is ordinarily weakest. This part of the window is therefore the most effective and, similarly, windows in monitors high above the floor are more effective than in the sidewalls. When monitors are used the total percentage of window area to floor area may be reduced to 25 per cent.

The reflective value of good white paint enables the ceiling areas to reflect light back into the areas of minimum illumination; also, the reflection and diffusion of the light received from the windows materially aids in conserving this light and in increasing the illumination of the so-called working plane, which is considered a horizontal plane approximately 4 ft. above the floor. White paint, then, can be made as much a production tool as a lathe, a shaper or any other machine. What applies to its function in the utilization and control of daylight applies also in connection with artificial light. Its values are therefore both economic and humanitarian.

Heavy Current Demand Felt in British Steel

LONDON, ENGLAND, July 16 (*By Cable*).—British pig iron demand is quite active, resulting in combination with higher ore prices in a rise of 2s. 6d. per ton in most areas.

There is also a heavy current demand for semi-finished and finished varieties, which means that the holidays will be curtailed in order to meet requirements.

Substantial orders are being received for construction material and inquiries from South Africa and India are particularly lively.

Heavy bookings for tin plates are being maintained; export business in this line being mainly with South America, Australia, Africa and the Continent.

At the annual meeting of Richard Thomas & Co. this week, the chairman announced a proposal to erect a strip mill at Redbourn, Lincolnshire, with an annual capacity of 150,000 tons of tin plates and sheets.

A Russian order for 6500 tons of thin sheets has been booked. Business with the Far East has been adversely affected by uncertainty of C.I.F. prices caused by the cartel's denunciation of the agreement with the Far Eastern shipping conference.

An export agreement has been reached between Poland and the International Export Wire Co. Negotiations between British makers and the continental cartel are being actively pressed and many details will be settled at the forthcoming meeting in Brussels on July 25.

British exports of pig iron for June totaled 10,500 tons, of which 1200 tons were shipped to the United States. Total exports of iron and steel for the month of June aggregated 195,000 tons.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9	
Billets, open-hearth	£5 10s.	to £5 15s.
Tin plate, per base box	*18s. 2d.	to 19s.
Steel bars, open-hearth	£7 17½s.	
Beams, open-hearth	£7 7½s.	
Channels, open-hearth	£7 12½s.	
Angles, open-hearth	£7 7½s.	
Black sheets, No. 24 gage	£9 5s.	
Galvanized sheets, No. 24 gage	£11 5s.	

*To July 1; 18s. 5d. to 19s. 3d. thereafter.

Official Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £

Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange

Billets, Thomas	£2 7s.	
Wire rods, No. 5 B.W.G.	£4 10s.	
Steel bars, merchant	£3 5s.	
Sheet bars	£2 8s.	
Plate, ¼ in. and up	£4 2s.	6d.
Plate, 3/16 in. and 5mm.	£4 4s.	8d.
Sheets, ⅛ in.	£4 9s.	8d.
Beams, Thomas	£3 2s.	6d.
Angles (Basic)	£3 2s.	6d.
Hoops and strip base	£4 2s.	6d.
Wire, plain, No. 8	£5 7s.	6d.
Wire nails	£5 15s.	
Wire, barbed, 4 pt. No. 10 B.W.G.	£8 15s.	

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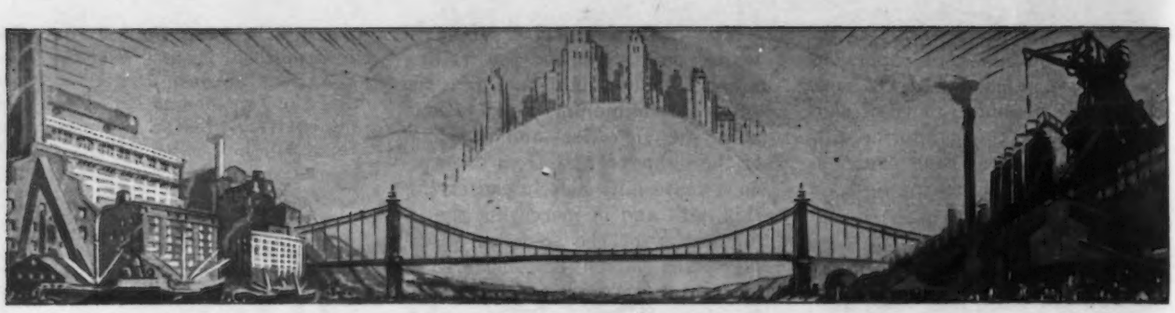


Plant Expansion and Equipment Buying

Machine Tool Activity Resists Seasonal Trend

THE machine tool market continues to contradict seasonal trends. Anticipated summer recession in demand has not appeared and bookings are turning upward. All types of machines are in moderate demand.

Automobile buying is in immediate prospect with interest, this week, centered upon the expanding operations of Chevrolet at Flint and Saginaw.

Small tool demand has taken on a decided impetus. This is regarded as an indicator of excellent fall business for machine tools, since small tool demand usually leads by some weeks in trade movements.

Several dealers report the fact that business is being lost because of extended deliveries. One line of grinders cannot be had in less than eight weeks. Skilled labor shortage is also making itself felt.

◀ NORTH ATLANTIC ▶

Tide Water Oil Co., 17 Battery Place, New York, has secured permit for new bulk oil storage and distributing plant on Penobscot River, Bangor, Me., consisting of dock for tanker service, warehouse units and other buildings. Cost over $125,000 with equipment.

Signal Supply Officer, Army Base, Brooklyn, asks bids until July 26 for 10 gasoline-driven engine generators, insulators, radio transmitters, radio receivers and other equipment (Circular 169).

Board of Education, City Hall, Troy, N. Y., plans installation of manual training department in new multi-unit high school in Prospect Park district. Cost over $1,000,000 with equipment. Financing will be arranged through Federal aid. Appropriation of $100,000 has been authorized for preparation of plans and incidental work.

George Ehret Brewing Co., 217 East Ninety-second Street, New York, has arranged for purchase of brewery of Interboro Beverage Corpn., Melrose and George Streets, Brooklyn, formerly known as Leonard Eppig Brewery. Purchasing company, inactive for several months, will recondition for new plant, with installation of equipment for production of special Ehret brew. Louis J. Ehret will be in charge. Ehret company sold its former Hell Gate plant at Ninety-second Street and Second Avenue, New York, to Ruppert Brewery last April, which is occupying in near future for expansion in plant on Third Avenue.

Board of Education, Park Avenue and Fifty-ninth Street, New York, plans manual training department in new four-story high school at Jamaica Avenue and Elderts Lane, Queens Borough. Fund of $1,568,863 has been secured through Federal aid. W. C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect and superintendent for board.

WNYC Municipal Broadcasting Station, Municipal Building, New York, plans extensions and improvements, including new equipment. Cost about $30,000. Fund in that amount has been secured through Federal aid.

Albany Coca Cola Bottling Works, Inc., 1032 Broadway, Albany, N. Y., plans new one-story bottling works, 100 x 230 ft. Cost close to $125,000 with machinery.

Consolidated Oil Corpn., 45 Nassau Street, New York, has authorized bond issue of $75,000,000, of which about $7,000,000 will be used for purchase and development of oil lands and natural gas properties in different parts of country, including installation of machinery, pipe lines and other facilities. Such acquisitions will be made by different operating subsidiaries which include Sinclair-Prairie Oil Co., Sinclair-Wyoming Oil Co., Rio Grande Oil Co., Mexican Sinclair Petroleum Corpn. and other interests.

Hamilton Township Board of Education, 2090 Greenwood Avenue, Trenton, N. J., plans manual training department in new two-story school at Yardville, N. J. Cost about $200,000 with equipment. Financing is being arranged through Federal aid. H. L. Mack, 2428 Liberty Street, Trenton, is architect.

Solfo Paint & Chemical Co., 821 Pennington Avenue, Trenton, N. J., manufacturer of industrial chemicals, paints, oils, etc., has let general contract to William C. Ehret, 209 Academy Street, for one and two-story addition.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 23 for 1000 airspeed indicators (Schedule 5543), 500 aircraft engine cylinder thermometers (Schedule 5544), 1300 aircraft tachometer shafts (Schedule 5542), 500 aircraft pitot static tubes (Schedule 5540), and 25 aircraft vibrometers (Schedule 5545), for Philadelphia Navy Yard.

Empire Distilling Corpn., Eighty-second Street and Bartram Avenue, Philadelphia, plans rebuilding part of distilling plant recently destroyed by fire. Loss over $300,000 with equipment.

Board of Education, Administration Building, Parkway and Twenty-first Street, Philadelphia, plans new multi-story vocational school in South Philadelphia. Cost over $600,000 with tools and equipment.

Commanding Officer, Navy Yard, Philadelphia, is securing appropriation of $519,900 for extensions and improvements in buildings and facilities, part of fund to be used at Marine Corps supplies depot and Naval Ammunition Depot.

◀ WESTERN PA. DIST. ▶

Viscose Co. of America, Meadville, Pa., manufacturer of cellulose rayon products, with main mill at Marcus Hook, Pa., has let general contract to Wark & Co., 1608 Walnut Street, Philadelphia, for four one-story additions to local mill, two of units for general production and others for storage and distribution. Cost over $150,000 with equipment.

United States Engineer Office, Huntington, W. Va., asks bids until Aug. 5 for building and machinery for Gallipolis Locks, Ohio River, including two motor-driven oil pumps and accessories, one motor-driven air compressor, one 250-kva. gasoline-electric standby unit with auxiliary equipment, lock conduit and lighting system, oil piping, tanks, relief valves and other fittings, six-panel switchboard and instruments, and one 7½-ton hand-operated crane.

Cy-Co Products Co., an interest of City Chemical Corpn., 122 West Twenty-second Street, New York, manufacturer of industrial and other chemicals, is establishing branch plant at Fairmont, W. Va., where property is being acquired. Cost over $65,000 with machinery.

City Council, Charleston, W. Va., has authorized plans for new municipal incinerator plant. Cost over $80,000 with furnaces, mechanical-handling and other equipment. Financing is being arranged through Federal aid.

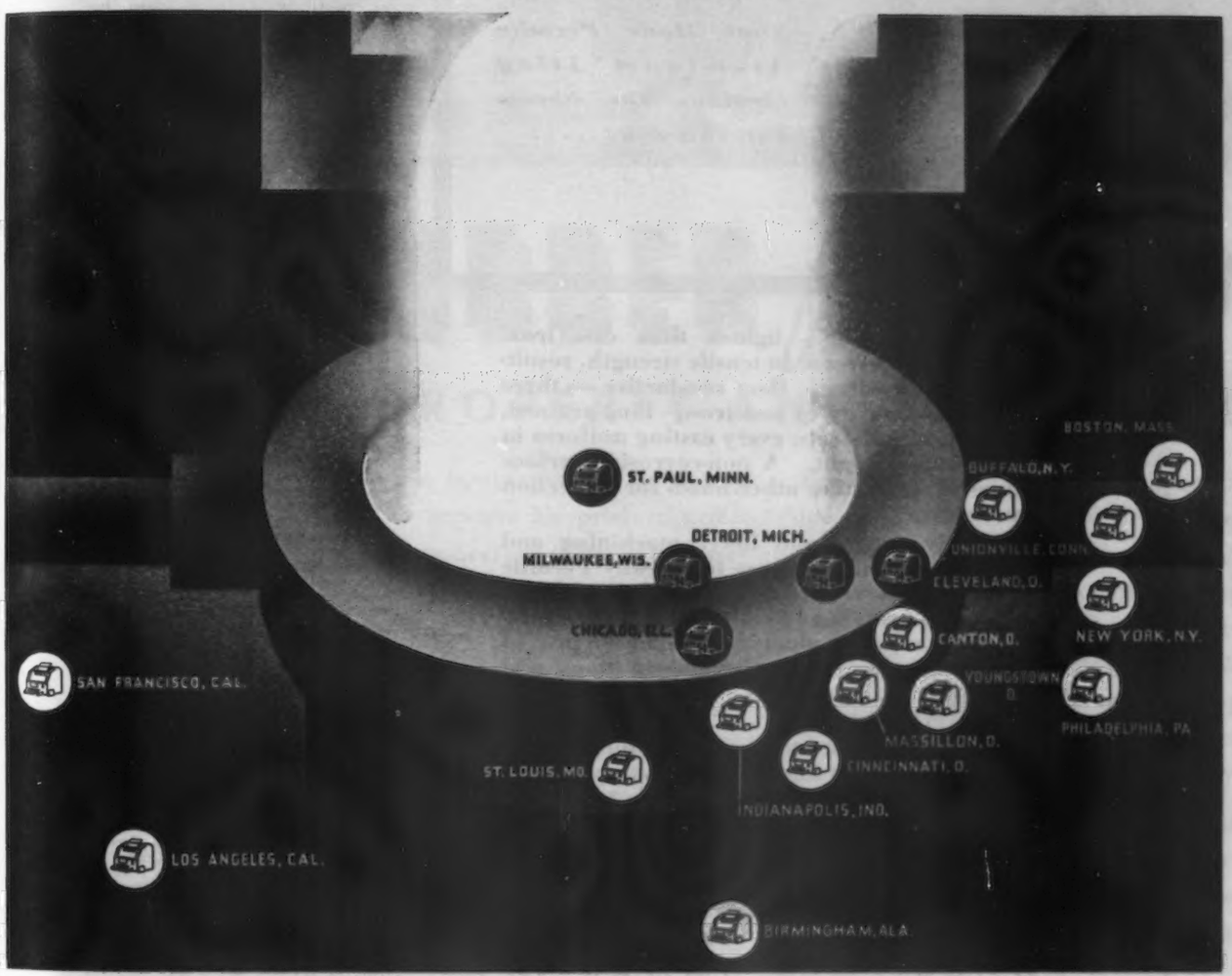
◀ OHIO AND INDIANA ▶

Fox Co., Third and Race Streets, Cincinnati, manufacturer of metal name plates and other metal stampings, has plans for one-story addition, 45 x 177 ft. Cost over $40,000 with equipment. J. J. Brown, 4207 Eileen Drive, is architect.

Saw & Knife Specialty Co., 1375 East Thirty-third Street, Cleveland, manufacturer of saws, knives and other edge products, has leased two-story factory at 6528 Carnegie Avenue, S. E., about 12,000 sq. ft. floor space, for new plant, doubling present facilities, and will remove to new location.

Sterling China Co., Wellsville, Ohio, has let general contract to D. F. Nellis &

"Bell System Teletypewriter Service means . . . better service to customers . . . increased efficiency . . . closer co-ordination . . . far-reaching economies." REPUBLIC STEEL



REPUBLIC STEEL has used Bell System Teletypewriter Service since 1930—finds it especially valuable today when hand-to-mouth buying is common practice and fast delivery a vital competitive factor. All orders are teletyped to the proper mill on special printed forms. A single typing produces enough *identical* copies for all purposes, at all connected points. With these results:

1. Fewer errors—so costly with large orders in production; 2. No retyping; 3. No rechecking; 4. Time saved all along the line; 5. Better control of production schedules; 6. Extra orders handled without proportionate increase in cost.

Republic's Manager of Orders writes, "Teletypewriter Service has effected far-reaching economies in our organization, many of which can be calculated in dollars and cents; but more important are the incalculable benefits such as better service to our customers and the increased efficiency which comes from closer co-ordination between the units of a large organization."

Smaller businesses benefit equally from the *speed* and *accuracy* of Teletypewriter Service. Your local Bell Company will be glad to tell you how it will cut the cost of distance for *your* business.

Perhaps

YOUR PRODUCT CAN BENEFIT

From The Advantages That Made Permite Aluminum Alloy Castings The Choice For This Job!.....

LIGHT weight—60% lighter than cast iron. Strong—a 25% increase in tensile strength, resulting from heat-treating. Heat conductive — three times the conductivity of cast iron. Fine grained, free from hidden defects, every casting uniform in dimensions and weight. A non-corrosive surface that requires no paint or other finish for protection or appearance.

To these advantages, add lower machining and shipping costs—and it is easy to see why Permite Castings were chosen for this portable tool housing. They are bringing new applications for aluminum alloys to many products. Thus, to the proved advantages of aluminum, Permite Castings add other sought-after qualities that few industries can afford to overlook.

It will cost you nothing to investigate these better castings today. Write for full information, or forward blueprints for recommendations and quotations.

ALUMINUM INDUSTRIES, INC., Cincinnati, Ohio

PERMITE *Aluminum* ALLOY CASTINGS

Permanent Mold ★ Semi-Permanent Mold ★ Sand Cast

Sons, East Liverpool, Ohio, for addition, comprising part of expansion to be carried out at plant, including installation of new tunnel kiln and other equipment. Cost about $150,000 with machinery.

Monarch Engineering Co., First Street and Patterson Boulevard, Dayton, Ohio, manufacturer of water systems and other engineering equipment, plans rebuilding part of three-story plant recently destroyed by fire. Loss over $50,000 with machinery.

National Bronze Corpn., Cincinnati, has been organized by Harry Stickney and Frederick D. Berger, care of Paxton & Seasongood, Union Central Building, representative, to manufacture brass, bronze and kindred metal products.

Contracting Officer, Material Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until July 22 for 20 sets gun mounts and adapter parts, tie rods, tie rod pins, tie rod assembly, one double gun mount mounting bracket, one tilting arm, one tilt control lever, one double gun mount plunger, gun mount socket rings, etc. (Circular 10), 20,000 bottom cover fastening screws (Circular 3); until July 23, propeller hub assemblies (Circular 820), three vacuum pumps, vacuum gage, air pump plate, bell jars, etc. (Circular 6); until July 24, 180 micrometer calipers (Circular 5); until July 25, suction gage assemblies in lots of 600 to 1000 (Circular 822), manifold pressure gage assemblies in lots of 300 to 800 (Circular 828), tachometer assemblies in lots of 300 to 600 (Circular 826); until July 26, air-speed pitot static tube assemblies in lots of 700 to 1200 (Circular 825), power venturi type tube assemblies in lots of 700 to 1000 (Circular 827), 600 air-speed indicator assemblies (Circular 823), clock assemblies in lots of 400 to 800 (Circular 813).

Screw & Fastener Supply Co., an interest of Automotive Products Co., 3000 Wahill Road, Cleveland, manufacturer of automobile specialties, has leased former mill of Salem Rubber Co., Salem, Ohio, and will remodel for new plant. Cost over $25,000 with equipment.

Arko, Inc., 3865 Washington Boulevard, Indianapolis, has been organized by Horace M. Arzet and Thomas H. Komstohk, address noted, to manufacture heating and ventilating equipment and parts.

Fox Co., Cincinnati, metal specialty manufacturer, has purchased former plant of Davis Welding Co., 3400 Beekman Street, and will erect one-story office addition and 50-ft. building extension for Sept. 1 occupancy.

BUFFALO DISTRICT

American Radiator Co., 1803 Elmwood Avenue, Buffalo, a unit of American Radiator & Standard Sanitary Corpn., New York, has filed plans for one-story addition, part of unit to be used as a foundry. Cost about $100,000 with equipment.

Commissioner, Department of Mental Hygiene, State Office Building, Albany, N. Y., asks bids until July 24 for new boilers and accessories, coal-handling and other power house equipment for power plant at State School, Rome, N. Y.

Bell Aircraft Corpn., Buffalo, is being organized by Lawrence D. Bell, 2050 Elmwood Avenue, who recently resigned as vice-president and general manager of Consolidated Aircraft Corpn., Elmwood Avenue. New company will specialize in production of military airplanes and will take over one of plant units now being vacated by Consolidated company, which is removing its works to San Diego, Cal., where large plant is in course of construction. Removal is scheduled for completion by Aug. 15, when Bell company will begin operations for parts manufacture and assembling. Ray P. Whitman, heretofore vice-president, and Robert J. Wood, chief engineer, Consolidated company, both recently resigned, will become associated with Bell Aircraft Corpn. in official capacities.

NEW ENGLAND

General Electric Co., Boston Avenue, Bridgeport, Conn., has let general contract to Gellatly Construction Co., 26 Housatonic Avenue, for two one-story additions, 80 x 122 ft., and 80 x 96 ft. respectively. Cost close to $90,000 with equipment.

Hodgman Rubber Co., Framingham, Mass., has let general contract to Julius J. Conviser, 333 Washington Street, Boston, for two one-story additions, 65 x 90 ft., and 60 x 65 ft. Cost over $45,000 with equipment. Isador Richmond, 248 Boylston Street, Boston, is architect.

Cogswell Mfg. Co., Pittsfield, Mass., has been organized by Frederick B. and Lloyd B. Cogswell, 1730 Westfield Street, West Springfield, to manufacture machinery, parts and tool specialties.

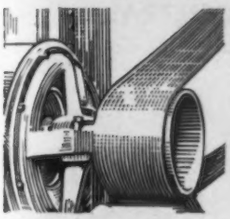
Landers, Frary & Clark, New Britain, Conn., manufacturer of electrical heating and cooking appliances, cutlery, etc., has asked bids on general contract for one-story metal enameling works, 100 x 120 ft. Cost over $50,000 with equipment. W. F. Brooks, Lewis and Gold Streets, Hartford, Conn., is architect.

MICHIGAN DISTRICT

Briggs Mfg. Co., 11631 Mack Avenue, Detroit, manufacturer of steel automobile bodies, etc., has let general contract to Martin Krausmann Co., 955 East Jefferson Street, for one-story addition, to cost over $50,000 with equipment. Albert Kahn, Inc., New Center Building, is architect and engineer.

United States Treasury Department, Public Works Branch, Washington, plans new multi-story automobile service, repair and garage building at Detroit, for motor trucks and cars for postal department. Cost over $500,000 with tools and equipment.

Goodrich air hose stands constant flexing from air pulsations, and at the same time resists high pressures, oil from the compressor, and abrasion from dragging over ground and rocks.



Modern Goodrich rubber belts, embodying 14 important improvements, are made to withstand millions of flexes without separation of plies or undue stretch.

Inflations in milking machines are made of Goodrich rubber because it can stand flexing at the rate of 50 times a minute and is sanitary, tasteless and odorless.

Life of carpets is multiplied, comfort increased, by use of a long-flexing Goodrich rubber as a cushion between carpet and floor.

RUBBER *for* RECOVERY

A PROPERTY AND A PROMISE

MANY a manufacturer is employing rubber to improve his product, defeat obsolescence, or create something entirely new. One of the many properties of rubber—one which you might use in your product or process—is flexibility—its ability to recover original shape after millions of compressions or flexes.

For example, thousands of railroad cars are lighted by generators driven from the car axles by Goodrich belts. Battered by flying cinders, drenched by rain, often weighted by ice, always twisted and jerked by the pitching car—these belts perform miracles of dependability and long life.

Of course, flexibility is only one of the many properties of modern rubber which make it important to industry. Goodrich has developed the science of compounding so that rubber can now be made resistant to chemicals, oil, heat, air. Goodrich has perfected a method of attaching rubber to metal with an inseparable bond. Goodrich has developed controls in compounding and manufacturing which can produce a rubber material or product of unbelievable uniformity.

Unless you have recently investigated the possibilities of rubber in your product or process you can have no idea of how it may be able to reduce your costs, increase production, reduce waste, add new sales appeals. Just as a matter of business insurance, see what Goodrich engineers may be able to suggest. The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

Anaconda Wire & Cable Co., Muskegon, Mich., has taken out a permit for extensions and improvements in local plant. Cost close to $30,000 with equipment. Company headquarters are at 25 Broadway, New York.

Rich Mfg. Corpn., Battle Creek, Mich., recently organized by George R. Rich, Sr., Battle Creek, founder of Wilcox-Rich Corpn., Detroit, plans early operation of new plant for production of cylinder heads, valves, tappets and kindred automotive equipment. Building is being acquired.

Kalamazoo Stove Co., Kalamazoo, Mich., manufacturer of stoves, ranges, parts, etc., will carry out expansion in malleable iron works in connection with plant addition, recently referred to in these columns, increasing production facilities in that department by 50 per cent. Other divisions, also, will be extended. Contract for building work has been let to O. F. Miller Co., Kalamazoo. Cost over $50,000 with equipment. Leroy & Newlander, Kalamazoo, are architects.

MIDDLE WEST

Crowe Name Plate Mfg. Co., 1749 West Grace Street, Chicago, manufacturer of metal name plates and kindred stamped metal products, has let general contract to Robert Goldie, 19 South La Salle Street, for one-story plant, 107 x 150 ft. Cost over $65,000 with equipment. George W. Klewer, 7631 North Eastlake Terrace, is architect.

United States Engineer Office, Rock Island, Ill., asks bids until July 29 for new Lock No. 17, Mississippi River, including steel forgings, nickel-steel forgings, nickel-steel castings, iron castings, corrugated galvanized pipe, rigid metal conduit, brass pipe, steel pipe, fuel oil tank storage, gate valves, operating machinery and other equipment (Circular 268).

Universal Battery Co., 3140 South La Salle Street, Chicago, manufacturer of electric storage batteries and parts, has purchased plant and business of Herbert E. Bucklen Corpn., Elkhart, Ind., manufacturer of electric plant equipment, and will operate as an affiliated interest.

Common Council, Spring Valley, Minn., will soon ask bids for new municipal electric light and power plant, and electrical distribution system, including Diesel engine-generator unit and accessories. Cost about $110,000. G. M. Orr & Co., Baker Building, Minneapolis, Minn., are consulting engineers.

Common Council, Walhalla, N. D., is arranging financing through Federal aid, in amount of $49,000, for new municipal electric light and power plant. Bids will be asked soon. C. D. Norton, Bismarck, N. D., is consulting engineer.

Ohmite Mfg. Co., 636 North Albany Avenue, Chicago, manufacturer of electrical equipment and parts, has asked bids on general contract for new one-story plant, 105 x 125 ft. Cost over $70,000 with equipment. Alfred S. Alschuler, 28 East Jackson Boulevard, is architect.

City Council, Villisca, Iowa, will soon take bids on revised plans for new municipal electric light and power plant and distribution system. Cost about $140,000. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

WASHINGTON DIST.

General Purchasing Officer, Panama Canal, Washington, asks bids until July 30 for 75,000 ft. copper-covered steel wire, 300,000 ft. copper wire, 5000 ft. cable, 4000 ft. stove wire, 2500 ft. trolley wire, recording gages, watthour meters, electric lighting fixtures, cartridge fuses, 20,000 conduit bushings and other supplies (Schedule 3072).

Procurement Officer, Chemical Warfare Service, Edgewood Arsenal, Md., asks bids until July 23 for 250-lb. capacity bronze strainers (Circular 1).

Appalachian Electric Power Co., Roanoke, Va., will build new transmission lines in Tazewell and Buchanan Counties, with connection with present power lines at Richlands, Va., where substation will be extended and new transformers and other equipment installed. Cost close to $150,000 with equipment.

Revere Copper & Brass, Inc., New York Central Building, New York, manufacturer of brass and copper tubing and kindred metal products, has purchased plant and business of Baltimore Tube Co., 1301 Wicomico Street, Baltimore, manufacturer of kindred seamless brass and copper tubing, etc., and will be operated as a new unit. Purchasing company has plants at Highlandtown, near Baltimore, Taunton, Mass., Rome, N. Y., and other points.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 23 for indicators and recorders, and spare parts (Schedule 5536), fuel oil meters (Schedule 5506), brass pipe (Schedule 5533), brass and copper pipe (Schedule 5534); until July 26, barrel bolts, curtain rod brackets, etc. (Schedule 5546), soot blowers and spare parts (Schedule 5525), refrigerating plants and spare parts (Schedule 5504), eight steering gears and spare parts (Schedule 5548), eight electric-hydraulic windlasses and spare parts (Schedule 5547), six ice-making units, complete with expansion coils, valves, etc. (Schedule 5553), for Eastern and Western yards; three engine-generators (Schedule 5537), for Submarine Base; until July 23, two motor driven metal-cutting hacksaws (Schedule 5559), three 150-kva. distribution type transformers (Schedule 5551), for Norfolk, Va., Navy Yard.

SOUTH ATLANTIC

Gulf Refining Co., Gulf Building, Pittsburgh, has acquired tract at Fayetteville, N. C., with about 400-ft. frontage on Cape Fear River, as site for new bulk oil storage and distributing plant. Cost over $75,000 with steel tanks and other equipment.

Aiken School District, Aiken, S. C., plans manual training department in new two-story high school. Fund of $125,000 is being arranged. Willis Irvin, Augusta, Ga., is architect.

Indian River Citrus Association, Fort Pierce, Fla., has authorized erection of new one-story citrus fruit packing plant. Cost about $50,000 with mechanical-handling and other equipment.

Swift & Co., Union Stock Yards, Chicago, have acquired plant and business of LaGrange Cotton Oil Co., LaGrange, Ga., for branch plant for production of cottonseed oil products. Extensions and improvements will be made, including new equipment.

SOUTH CENTRAL

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until July 31 for five steel tanks, each with capacity from 5000 to 12,000 gal., for oil storage at Wheeler hydroelectric power plant.

Board of Harbor Commissioners, City Hall, Memphis, Tenn., is planning new municipal grain elevator on waterfront site, with initial capacity of 1,500,000 bu. Cost about $550,000 with elevating, conveying, screening and other equipment. Financing will be arranged through Federal aid. MacDonald Engineering Co., 1 North LaSalle Street, Chicago, is engineer. John B. Edgar is chairman of board.

Board of Trustees, University of Kentucky, Lexington, Ky., plans new power house for central heating. Cost about $250,000 with equipment, pipe lines, etc. Financing will be arranged through Federal aid. Frank L. McVey is president.

Prentiss County Electric Power Association, Booneville, Miss., J. E. Cunningham, president, plans extensions and improvements in electrical distribution system, recently acquired from local interests. Extensions will also be made in transmission lines. Cost over $50,000 with equipment.

City Council, Greenwood, Miss., has been authorized at special election to arrange bonds for $192,000 for extensions and improvements in municipal electric light and power plants, and waterworks, including new equipment. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Department of Education, Chattanooga, Tenn., has plans for new vocational school, with metal-working, automotive, machine and other shops. Cost about $100,000 with equipment. Financing is being arranged through Federal aid. Martin & Franklin, Chattanooga, are architects.

SOUTHWEST

Columbian Steel Tank Co., 1507 West Twelfth Street, Kansas City, Mo., manufacturer of steel tanks and kindred plate products, has acquired property on Liberty Street for new one-story branch, primarily

EIGHT YEARS OF CONTINUOUS SERVICE

PLYMOUTH ROLLS ON • •

TRACK HAULAGE IS CHEAPER HAULAGE WITH A PLYMOUTH
GET DETAILS

Plymouth Locomotive at work at the modern Kaiser Packing Co. Plant

In Pleasanton, California, at the large modern plant of the Kaiser Paving Company, two Plymouth Diesel Locomotives have handled the entire 75,000 tons of aggregate output for eight consecutive years . . . and are still going strong. This proof of Plymouth's rugged endurance, long life and economy is multiplied hundreds of times by other similar records of service. Write for free bulletin.

PLYMOUTH LOCOMOTIVE WORKS

Division of THE FATE-ROOT-HEATH COMPANY · · PLYMOUTH, OHIO

ULTRA-CUT STEEL

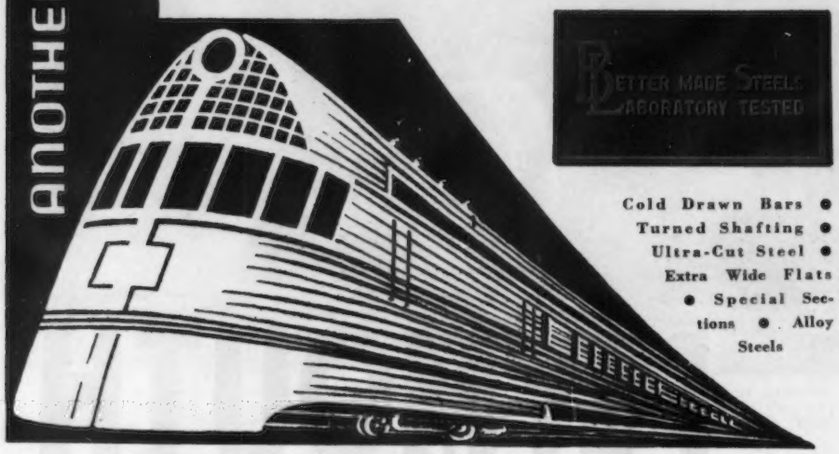
ANOTHER NEW RECORD

gives you "Streamline" production by reducing the cutting resistance on your automatic screw machines. It feeds faster, machines smoother and runs longer between tool grinds.

The "spool" at the right typifies the unusual machinability of this modern high-speed screw stock. On clocked tests, Ultra-Cut showed 42% increase in output over SAE 1112, raising the hourly production from 36 to 51 pieces while maintaining the same tool life. This item was fabricated from 7/8" Ultra-Cut at a speed of 278 S.F.M. against 120 for the other stock.

If you could duplicate these results on your own machines, would Ultra-Cut be worth trying? Hundreds of satisfied users have answered "yes"! Let us demonstrate some samples of Ultra-Cut screw stock in your own plant.

Ultra-Cut Folder No. 3-A will be sent on request



Cold Drawn Bars • Turned Shafting • Ultra-Cut Steel • Extra Wide Flats • Special Sections • Alloy Steels

Gliding so smoothly that the passengers hardly noticed the amazing speed, the Burlington Streamlined Zephyr recently flashed to a new record round-trip run from Chicago to St. Paul—862 miles in 705 minutes including stops, and 102 miles an hour on straight runs.

BLISS & LAUGHLIN, INC.

HARVEY, ILL. *Sales Offices in all Principal Cities* **BUFFALO, N.Y.**

for storage and distribution. Cost about $25,000 with equipment. A. A. Kramer is president.

City Council, Columbia, Mo., has plans for extensions and improvements in municipal electric light and power plant, including new turbo-generator unit, boilers and other equipment. Cost about $225,000. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

State Penal Board, State House, Little Rock, Ark., has authorized installation of shop equipment at local Tucker State Prison Farm, for manufacture of automobile license tags and metal signs for State highways.

American Portland Cement Co., Foreman, Ark., plans extensions and improvements, including installation of new machinery. Cost over $200,000 with equipment. Financing is being arranged through Federal aid.

Canadian Mill & Elevator Co., El Reno, Okla., plans rebuilding of portion of grain mill and elevator, recently destroyed by fire. Loss over $400,000 with machinery.

Black, Sivalls & Bryson, Inc., 2131 Westwood Street, Oklahoma City, Okla., manufacturer of oil-well equipment, steel tanks, etc., has plans for three new shop buildings at Ellinwood, Kan., comprising main one-story machine works and two service, repair and utility shops. Cost over $40,000 with equipment.

D. & B. Pump & Supply Co., 7628 Maple Avenue, Dallas, Tex., manufacturer of pumping machinery and parts, oil-well specialties, etc., plans one-story branch plant in Love Field district, Dallas, to cost over $75,000 with equipment. Company will also erect one story addition, 70 x 90 ft., to present Maple Avenue works, and make other extensions and improvements, including new equipment. Plans are under way for factory branches for service and repair of equipment in Mid-Continent oil field district. Entire program will cost in excess of $150,000. Company is affiliated with Emsco Derrick & Equipment Co., Los Angeles, manufacturer of general oil-well machinery.

PACIFIC COAST

Muscat Co-Operative Winery Association, Kingsburg, Cal., has let general contract to John C. Meyers, Stockton, Cal., for new winery, comprising distillery, fermenting unit, storage and distributing buildings and other structures. Cost about $70,000 with equipment. E. G. Ernst, 9 West Cleveland Street, Stockton, is architect.

Vegetable Oil Products Co., Wilmington, Los Angeles, has plans for new hydrogen gas plant, 30 x 50 ft. A power house and other buildings will be erected in near future. Entire project will cost over $50,000 with equipment. Albert C. Martin, Higgins Building, Los Angeles, is architect.

Bureau of Reclamation, Denver, asks bids until July 25 for one tunnel plug adit car for Boulder Dam, Boulder Canyon project, Arizona-California-Nevada (Specification 700-D); until Aug. 2, steel transmission towers and switch-yard structures for circuits Nos. 2, 4 and 5, Boulder power plant (Specification 634).

Steelform Contracting Co., 131 Perry Street, San Francisco, has filed plans for one and two-story storage and distributing plant at Harrison Street and Veronia Place. Cost about $30,000 with equipment. L. H. Nishkian, 525 Market Street, is engineer.

Idaho-Portland Cement Co., Pocatello, Idaho, plans addition to mill, primarily for storage and distribution. Cost over $65,000 with mechanical-handling and other equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 23 for one 30-in. motor driven bandsaw for Mare Island Navy Yard (Schedule 5528); until July 30, two motor-driven turret lathes for Puget Sound Navy Yard (Schedule 5560).

Gila Meat Co., Phoenix, Ariz., meat packer, will ask bids at once on general contract for new plant at Seventh Avenue and Watkins Road, to replace building destroyed by fire early in May. New units will include processing department, two smoke houses and other structures. Cost close to $50,000 with equipment.

Purchasing Agent, Alaska Road Commission, Seattle, asks bids until July 25 for steel castings and forgings, bolts, pins and other steel shapes for six 250-ft. steel spans.

FOREIGN

Stora Kopparbergs, A. B., Skutsgar, Sweden, manufacturer of sulphite cellulose products, has plans for additions to be equipped for a processing capacity of about 25,000 tons a year, doubling present output. Cost over $600,000 with machinery.

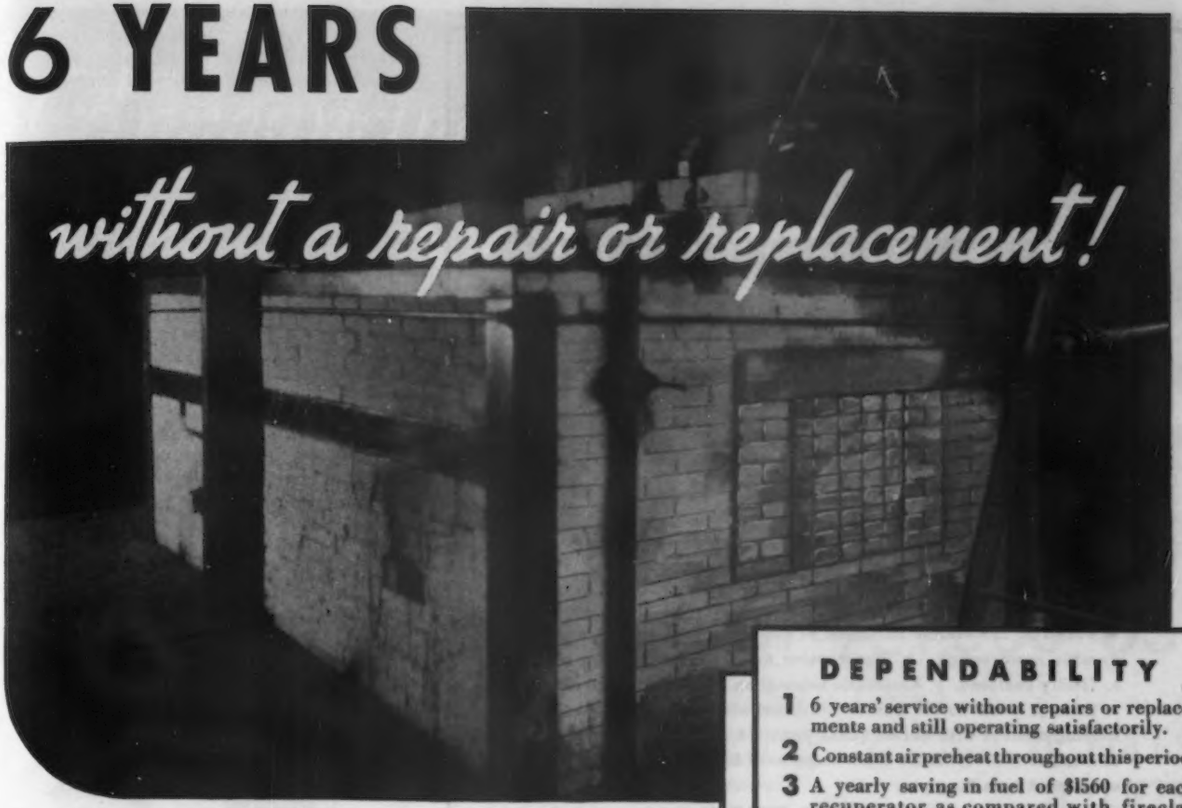
W. Canning & Co., Ltd., Great Hampton Street, Birmingham, England, manufacturer of grinding machinery and parts and kindred engineering products, plans expansion in electroplating and chromium plating department, providing about 35,000 sq. ft. floor space. Cost close to $100,000 with equipment.

South African Railway Commission, Johannesburg, South Africa, plans electrification of railway from Cato Ridge to Durban. Cost over $2,000,000 with equipment, including feeder lines, power substations and other structures. Similar electrification for line from Randfontein to Springs is also proposed, with cost of about $900,000.

Mario Laurenti, Ltd., Milan, Italy, plans erection of new plant for production of tin oxide and kindred products. A concession has been granted by Government for new works. Cost over $250,000 with equipment.

6 YEARS

without a repair or replacement!



• *Top of 88 tube 4 pass Recuperator serving Revolving Glass Pot, natural gas fired, with air under pressure.*

DEPENDABILITY

1. 6 years' service without repairs or replacements and still operating satisfactorily.
2. Constant air preheat throughout this period.
3. A yearly saving in fuel of $1560 for each recuperator as compared with fireclay recuperators.
4. First cost no higher than fireclay recuperators.

Surely this is Dependability Plus.

THE primary purpose of installing a recuperator on a furnace is to save fuel and reduce costs. If the recuperator interferes with the continuous operation of that furnace then the tail is wagging the dog.

A recuperator must be dependable to do its job properly.

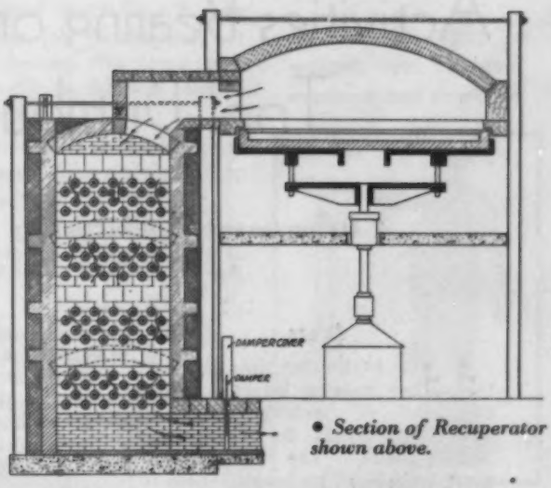
Consider the record of three Carborundum Company Recuperators installed on the revolving glass pot furnaces of Ball Bros. Co., Muncie, Indiana. Their performance records are given at the right. One more recuperator was installed two years ago.

Let our engineers make a survey of your furnaces.

The Carborundum Company

RECUPERATOR

Equipped with "Carbofrax" Tubes



• *Section of Recuperator shown above.*

THE CARBORUNDUM COMPANY

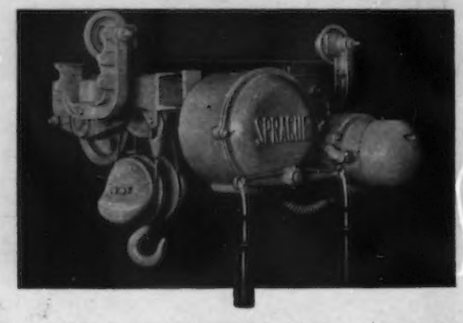
Refractory Division, Perth Amboy, N. J.

District Sales Branches: Boston, Chicago, Cleveland, Detroit, Philadelphia, Pittsburgh. Agents; L. F. McConnell, Birmingham, Ala.; Christy Firebrick Company, St. Louis; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Co., Los Angeles, San Francisco, Seattle; Denver Fireclay Co., El Paso, Texas; Williams and Wilson, Ltd., Montreal, Toronto, Canada. (Carborundum and Carbofrax are registered trade-marks of The Carborundum Company.)

SPRAGUE

Close Headroom

ELECTRIC HOISTS



● **Features: 1. Absolute minimum of headroom consistent with safe, durable construction. 2. Direct worm drive. 3. Few moving parts. 4. Totally enclosed. 5. Automatic lubrication. 6. Noiseless operation. 7. Rope or push button control. 8. Anti-friction bearings. 9. Ball bearing trolleys with swivel yokes permit hoist to negotiate curves of small radius. 10. Hoist frame supported by trolley yokes and not suspended from king pin.**

SPRAGUE HOIST DIVISION

SHEPARD NILES CRANE & HOIST CORPORATION

356 South Schuyler Avenue, Montour Falls, N. Y.

Activities Bearing on Machine Tool Distribution

o o o

A Department Conducted by L. M. Waite

o o o

Areas

At this particular time there is more than passing interest in the reactions of metropolitan and Pittsburgh areas to Washington developments. The metropolitan area, because of its sensitiveness to administration activities; Pittsburgh, because of its importance as a metal working center.

Metropolitan Area

One dealer reports the closing of a number of orders during the first two weeks of July, which, for some reason or other, were held over from June closing. Two others advise of reasonably satisfactory orders and a normal volume of new prospective business. Another reports the last two weeks of June as having turned a large number of inquiries into orders, because of price advances effective late in June and early July. This dealer reports a falling off of inquiries since July 1. "Practically dead for the first half of July," is the language used by another prominent dealer in speaking of orders and inquiries.

Pittsburgh Area

One distributer writes: "A very reasonably satisfactory number of orders are on our books. Some of these may have been stimulated by price increases which went into effect prior to July 1. Some of the recent developments in Washington should be encouraging to our industry. At least the administration has found that there is a referee in the ring to see that blows are kept 'up.' We are sorry to note the front-row call for a new referee. Old man business is still 'in there,' taking the blows as they come and getting stronger every minute."

Another dealers says: "It looks as if we are going to be kept on the go right through dog-days. There is a lot of equipment study on the boards in engineering departments."

New England Area

(This from the Attorney General's home state.) "From any viewpoint other than politics, we never could figure out the Administration's chief legal adviser—evidently the Supreme Court couldn't either. It is far easier, up here, to sell machine tools today than it is to analyze the workings of those minds which fail to recognize production as an element of more things for more people, and who, therefore, seem bent upon substituting political machines for production equipment."

The Cleveland Machine Tool Show

There have been inquiries as to whether or not the time allotted to average visitors at the coming Cleveland machine tool exposition will be limited to the week of Sept. 16, and as to whether the time from Sept. 11 to 16 is to be devoted to prearranged showings and demonstrations only.

The answer appears to be that the exposition opens to all Sept. 11 and remains open each day, except Sunday, until Sept. 21. Hours, 9 a. m. to 6 p. m. Hotel rates will be held at normal figures. Excursion rates will be put on by railroads. Full particulars, on all matters, can be obtained by addressing the Machine Tool Congress, 1220 Guarantee Title Building, Cleveland, Ohio.

The Detroit area is said to be planning a ship load of machine tool visitors, utilizing the ship as headquarters during the period of the show.

A number of areas report hotel reservations by machine tool users for the entire period of the exposition. Reservations, it is said, will be occupied by inter-organiza-

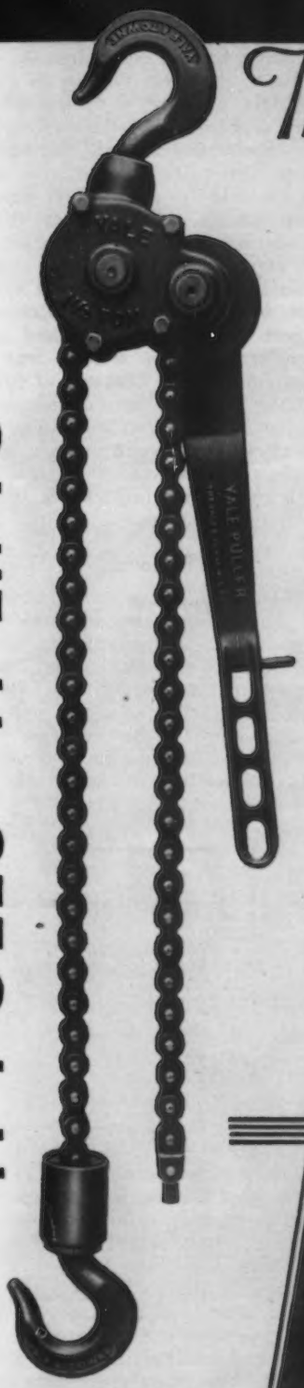
Announcing a New Device by

TRADE **YALE** MARK

The PUL-LIFT

THE TOOL OF A 1,000 USES

IT PULLS - IT LIFTS



The PUL-LIFT is the newest development of Yale engineers. In point of utility, economy and safety, it is one of the most important and useful tools presented to industry in a decade.

Loads of all kinds, up to 6 tons, are moved by the PUL-LIFT. Horizontally it is efficiently employed in stretching cables, pulling machines into position, pulling in boiler tubes, placing stone blocks (granite, marble, etc.) under polishing machines and for countless other purposes.

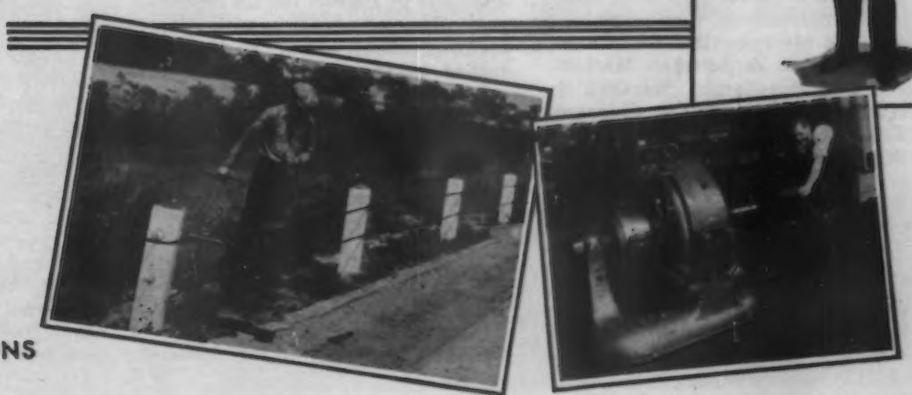
The PUL-LIFT is easy to operate. A quick thumb turn changes the action from lifting to lowering or vice versa.

Light in weight, compact and portable, it can be easily transported from one job to another. It is safe, strong and durable having the same outstanding safety factors which distinguish the famous line of Yale Hand Chain Hoists.

The pictures illustrate the universal serviceability of the PUL-LIFT. Ask the nearest Yale distributor to demonstrate how it can serve you.

IT PULLS, IT LIFTS

Unusually light in weight, yet rugged, compact and powerful.



CAPACITIES-
-¾, 1½, 3 and 6 TONS

THE YALE & TOWNE MFG. CO.

PHILADELPHIA DIVISION **Philadelphia, Pa., U.S.A.**

Makers of Yale Hand and Electric Chain Hoists, Electric and Hand Lift Trucks, Trolleys and Skid Platforms

When You Require
Coolant Pumps - - - - - - - - - -
Specify——
"BROWNIE"

A pump which has no packings to leak, no screens to clog. A pump which is entirely self-aligning. "Open" types (for setting on bottom of tank) and "Closed" types (for mounting on outside of tank) 10-100 G.P.M. A pump which handles anything from coolant, impregnated with grit and chips, to oil.

Write for Bulletin No. 10

THE TOMKINS-JOHNSON CO.
628 N. Mechanic St., Jackson, Michigan

tion groups; each group remaining three days.

Presentation

On Saturday, July 13, August H. (Gus) Tuechter, president of the Cincinnati Bickford Tool Co., was presented with a hall clock by company dealers from coast to coast. The clock carried a gold plate inscribed with the names of the donors and expressive of appreciation of the business character maintained by Mr. Tuechter over a period of 50 years. The presentation was made by J. R. Porter, president, Marshall Huschart Machinery Co., Chicago.

It is interesting to note that no dealer having taken over the Cincinnati Bickford line has ever given it up or been removed as the company representative. The Henry Prentiss Co., New York, took on the line when Mr. Tuechter started his company. The following companies took on the line when their own organizations were founded: Motch & Merryweather Co., Cleveland; Brown & Zortman Machinery Co., Pittsburgh; Marshall & Huschart Machinery Co., Chicago; Elliott & Stephens Machinery Co., St. Louis; W. E. Shipley Machinery Co., Philadelphia, and Harron, Rickard & McCone Co., San Francisco.

Apprenticeships

The Detroit area machine tool dealers are interesting themselves in the possibility of developing cooperative activity with Detroit manufacturers in the matter of a practical and less expensive method for training mechanics to fill the sadly depleted ranks in Detroit shops.

On June 28, some 30 members and guests met at Dearborn Inn, Dearborn, Mich., as hosts to J. G. Humberstone of the Edison Institute and Ford Museum. Details of methods employed by Mr. Ford in his effort to preserve for posterity the industrial achievements of the past were fully explained to the group.

Mr. Humberstone also outlined the philosophy back of the Henry Ford Trade School and the Artisan Guild. These enterprises are an outgrowth of the Ford principles of education, although Mr. Ford himself has nothing to do with the policy of the latter institution. The practical interest of the dealer group in the Artisan Guild is the fact that there is a physical plant available in Detroit for the promotion of a cooperative apprentice training school. This can be controlled by such manufacturers as may join in a movement to render so distinct a training service to the Detroit area. For such effort, the Artisan Guild presents a complete staff of men, thoroughly trained, whose services can be utilized for the active teaching.

It is understood that the fall months may see the completed development of plans worked out as a result of this initial movement on the part of Detroit Area Associated Machine Tool Dealers. It is to be hoped that through a broadening of this dealer activity, other areas may become interested in a like service to the industry, its employees and to communities wherein metal working plants are located.

Educational Sales Effort

It might be suggested to the dealer organization that there also exists a splendid opportunity to increase economic knowledge as to industrial production. Associated machine tool dealer salesmen, because of the great number of daily contacts over wide dealer coverage, represent an effective means for hammering in basic facts as to shop modernization. There is a fertile field for such effort among shop people who concern themselves but little with the records of experience. Concerted dealer activity in brushing up their salesmen in reference to the economic aspect of machine tools and production might go a long way in removing certain features of price-cutting and machine-tool-purchase neglect. Very often basic facts are insufficiently recognized by even dealers themselves. "Facts" are of high relative importance in developing decisions.

Personals

Walter H. Seipelt, well known in the metropolitan machine tool sales area, has joined the sales-engineering organization of Carey Machinery & Supply Co., Baltimore, Md. Mr. Seipelt will be identified with the machine tool division of the company's activities, primarily in the States of Maryland and Virginia.

Farrel-Birmingham Sales Conference

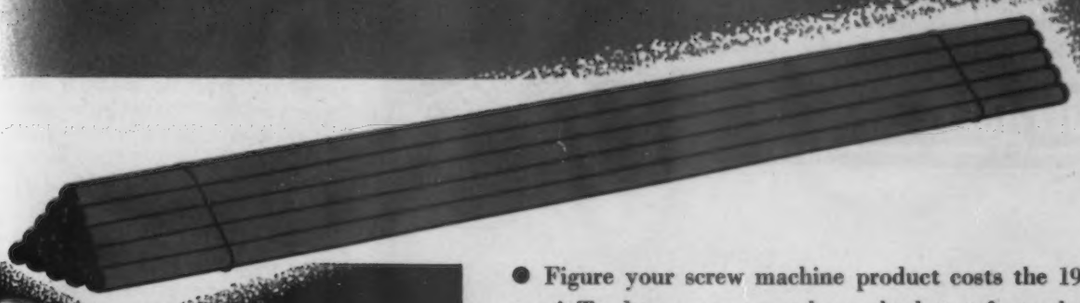
THE Farrel-Birmingham Co., Inc., recently held its annual sales conference at the company's offices at Ansonia, Conn. Representatives were present from New York, New Jersey, Buffalo, Akron, Chicago and Los Angeles.

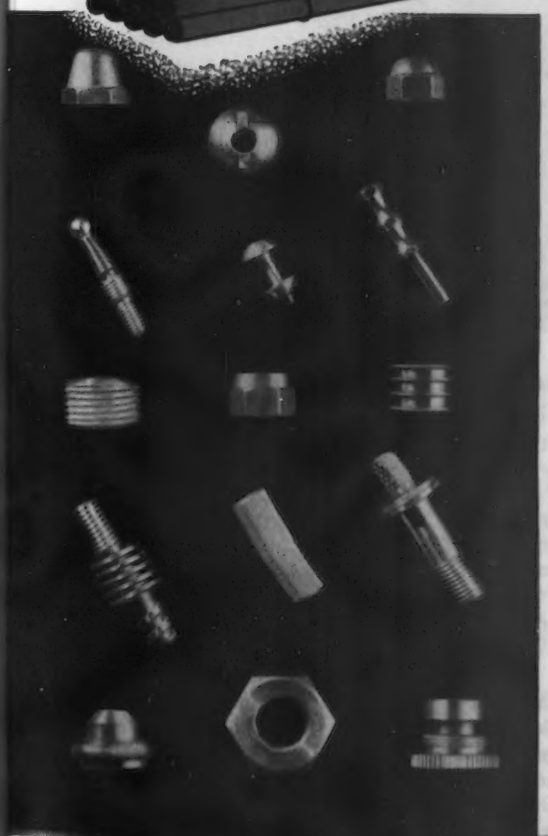
The sessions were devoted to discussions of the company's products, with particular reference to engineering, manufacturing and sales problems involved. New developments and improvements in design which have been made during the past year were explained by the sales and engineering department heads. These discussions were supplemented by visits through the shops to inspect the machinery then being built.

REDUCE YOUR PER-PIECE COSTS

with the latest facts on

ALUMINUM SCREW MACHINE STOCK





● Figure your screw machine product costs the 1935 way! To do so, you must have the latest facts about Alcoa Aluminum Screw Machine Stock.

First, we have made available all the sizes and shapes of rod you use, in ample stocks located to give you overnight delivery.

Second, we have a store of information about improved machining techniques that are being used successfully to reduce per-piece time. We are certain that if you will give us half a chance, we can show you how you can get finished costs per-piece that will be very attractive.

Also, when you use Aluminum you get the added advantages of light weight and resistance to atmospheric corrosion. Remember, too, that the color of Aluminum is in step with the modern trend in design.

Whether you make or buy screw machine products, we urge you to get the latest facts. Address ALUMINUM COMPANY OF AMERICA, 1885 Gulf Building, Pittsburgh, Pennsylvania.

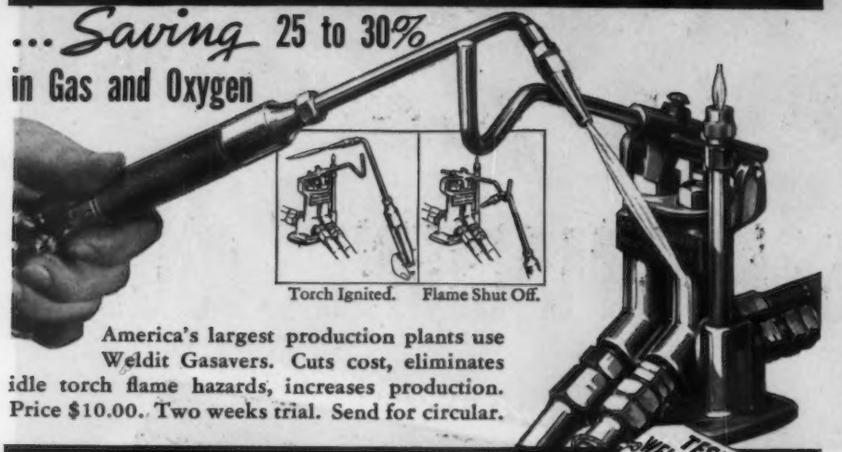
REG. U. S. PAT. OFF.

ALCOA · ALUMINUM

WELDIT Gasaver

AUTOMATICALLY SHUTS OFF FLAME BETWEEN WELDS

...Saving 25 to 30% in Gas and Oxygen



America's largest production plants use Weldit Gasavers. Cuts cost, eliminates idle torch flame hazards, increases production. Price $10.00. Two weeks trial. Send for circular.

WELDIT ACETYLENE CO. 641 BAGLEY AVE. DETROIT, MICH.

TEST THIS WELDIT GASAVER FREE FOR TWO WEEKS IN YOUR PLANT

Methods for Checking Gears

(CONTINUED FROM PAGE 17)

lar setting is obtained by the following formula:

$$Vr = \frac{Ld \times Tc \times 360}{Lg \times Tg}$$

in which:

Vr = Angle of revolution of table
Ld = Linear distance through which lead is tested
Tc = Number of teeth in cutter
Lg = Lead of gear shaper guide
Tg = Number of teeth in gear.

Example: Let, Ld = 0.600 in.; Tc = 27; Lg = 17.647 in.; Tg = 26 —then:

$$Vr = \frac{0.600 \times 27 \times 360}{17.647 \times 26}$$

= 12 deg., 42 min., 39 sec.

The machine is provided with an index plate having 36 notches. Select two notches or 20 deg. The difference, or angle Vi, between the required angular rotation Vr and 20 deg. is 7 deg., 17 min., 21 sec. This difference is made up by the use of gage blocks, the thickness of which is determined by the following formula:

$H_1 =$ Sine $Vi \times 5$

In which:

H_1 = Thickness of gage blocks necessary
Vi = Difference between required angle of rotation and two notches on index plate
5 = Center distance of fixed stop in table.

Then:

H_1 = 0.12688 x 5 = 0.6344 in.

The gear shown has a left-hand helix, so for the first setting the stud is brought against the stop block. If the gear had a right-hand helix, the first setting would be made with the gage blocks in place and the second setting with them removed.

In making the second setting, the fixture is withdrawn from the gear, after which the work is elevated and a gage block (in this case 0.600 in. plus the 0.100 in. block used in the first setting) is placed under the indicator plunger and top of the quill. The table is then positioned rotatively and gage block H_1 (in this case 0.6344 in. thick) placed between the stud and fixed stop. If the needle registers zero in the second setting, the lead of the gear is correct.

Zinc Ammonium Chloride

(CONTINUED FROM PAGE 21)

describing the practice found in some plants, the chapter on "Buckets, etc." can be referred to, with an additional comment, when describing the use of zinc ammonium chloride in the fluxing of boilers, drums and other large objects. Due to the amount of fluxing solution which remains inside of a range boiler and drum, regardless of the draining it may receive, the use of a preheating oven before immersing the material into the volatilizing flux on the kettle is a worthwhile safety factor.

Using in place of the described "hot plate" an oven of sufficient size and heating capacity to dry and preheat thoroughly one or more kegs over the entire surface, and disregarding the reference made to the use of "white fines" on the galvanized product, the practice covered in the chapter on "Malleable and Gray Iron Fittings" can be extended to include the fluxing of beer kegs for galvanizing. To prevent the kegs from picking up corrosion on the floor of the oven, which may have become corroded from the wet fluxing solution brought in on the kegs, it is advisable to install a well-perforated false floor in the oven, or to suspend the kegs from a rack.

The practice covering the use of zinc ammonium chloride in the fluxing of pole line and other hardware for galvanizing is the same as that described in the chapter on "Malleable and Gray Iron Fittings."

Note: The presence of too much aluminum in molten zinc affects and decomposes a zinc ammonium chloride volatilizing flux in the same manner as it does a flux made from sal ammoniac.

In view of its stronger fluxing qualities, the question is often asked why sal ammoniac is not used as a liquid flux, employing it in the same manner that is recommended with zinc ammonium chloride. Sal ammoniac, the salt of a strong acid and weak base, is very corrosive as a liquid, and material fluxed in either a hot or cold solution becomes so heavily oxidized upon removal from the solution that subsequent galvanizing is impractical.

In Table VIII data are shown

14 gauge to ½" inclusive up to 72" wide
15-16 gauge up to 60" wide
18 gauge up to 48" wide
in either cut lengths or coils
HOT ROLLED
TRADE MARK
YOUNGSTOWN
SHEETS

HOT ROLLED
TRADE MARK
YOUNGSTOWN
STRIP

BY the erection of its new continuous hot mill, with capacities as listed above, Youngstown again demonstrates its determination to keep pace with today's needs and be prepared for tomorrow's demands.

320

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices YOUNGSTOWN, OHIO

MURCHEY
TYPE "C—O"

SELF-OPENING ROTATING
DIE HEAD

It is a rugged self-opening die head of the rotating type which holds its thread size without frequent adjustments due to compact design employing few parts.

Collar trip insures positive opening at any point.
Chasers backed up with solid bearings which do not require cams for operation, thus eliminating tapered threads.
Chasers interchangeable with type "G" stationary die head.
Sizes are from 7/16" to 4".

MURCHEY MACHINE & TOOL CO. 951 PORTER ST. DETROIT, MICH.

on the number of pounds of solid zinc ammonium chloride (1:3 molecular ratio) required to produce a given Beaumé reading in one gallon of water.

In the general run of plants where job or miscellaneous galvanizing is done, zinc ammonium chloride as a liquid flux has an advantage over the combination of hydrochloric acid and sal ammoniac. The material galvanized is, for the most part, of irregular shape, having pockets, threads, seams, corners, etc., and it is impossible to obtain the same thorough and efficient fluxing from a quick dip into a hydrochloric acid solution and then passing through a few inches of a viscous volatilizing flux, as will be obtained from complete immersion into a strong liquid flux which contacts and coats with flux every bit of the exposed surface, regardless of the shape of the material. Also, as the standards governing the equipment used and the practice followed are not as high in the majority of plants doing job galvanizing as they are in the average sheet, wire or pipe galvanizing plant, elimination of hydrochloric acid with a consequent reduction in dross becomes an economic advantage of even more than usual importance and value.

Due to the fact that the type, shape and size of material galvanized in a job plant vary so much and so often in the course of a day's work, an individual fluxing practice for each major type or grade of work is out of the question; and while a hot fluxing solution in conjunction with a "hot plate" and no volatilizing flux on the surface of the molten zinc is the simplest and most economical method of using zinc ammonium chloride, the amount of fluxed material of a type and shape that is not conducive to self-drying even with the use of a "hot plate" is such as to necessitate the use of a cold fluxing solution sufficiently high in strength to take care of all grades of work. The strength of this solution should average 20 deg. Bé., although this depends somewhat on whether the volatilizing flux, made deep with the use of a foaming agent and carried on the surface of the molten zinc, is used more to reduce the splattering of zinc than to give additional fluxing to the material passing through it.

Table VIII

Relation of Beaumé Reading to Amount of Solid Zinc Ammonium Chloride in One Gallon of Water:

Temperature of Solution 60 deg. F.	160 deg. F.	Beaumé Reading
1.25 lb.	1.9 lb.	10°
3.9 lb.	4.5 lb.	20°
7.5 lb.	8.6 lb.	30°
14.5 lb.	.....	40°

The pickling and rinsing of the material prior to fluxing require the usual supervision to prevent acid "carry over" and the expensive diluting of the fluxing solution by rinse water. Inasmuch as the economic and operating success of zinc ammonium chloride as a liquid flux is affected materially by this pickling and rinsing, and in view of the poor equipment and practice "back-log" of a large portion of the job galvanizing industry, attention is again called to the importance and necessity of good pickling with thorough yet speedy rinsing and draining if full and satisfactory returns are to be expected from the use of zinc ammonium chloride.

Because of the many operating, mechanical, and other factors which enter into and have a direct bearing upon the efficiency and economy of a galvanizing operation, no article commenting upon and describing any part of this operation can do more than scratch the surface of all that has been done and all that has been said regarding it. Therefore, these articles have not endeavored to cover all of the problems or answer all of the questions which may arise with the use of zinc ammonium chloride, but have been confined, insofar as this flux is concerned, to describing briefly what zinc ammonium chloride is, the type of flux that it is, and the only manner in which it can be used efficiently and economically in the galvanizing of iron and steel. On the strength of what it has shown in the majority of operations, zinc ammonium chloride merits an important place in galvanizing and, as a competitive flux of sal ammoniac in these operations, should receive the serious consideration of all galvanizers.

The writer wishes to express his appreciation to those executives who furnished photographs of the galvanizing operation in their plants for the purpose of illustrating this article; to E. H. McClelland, librarian, Technology Department, Carnegie Library, Pittsburgh, Pa., for his assistance and cooperation; and to those friends in the galvanizing industry who gave of their knowledge and practical experience; all of which was of material value in the preparation of these articles.

JUST BETWEEN US TWO

Emulation in Full Caps, B.F.

IT was said here recently to be the height of snobbishness to forego the use of a good idea simply because someone else happened to think of it first.

Is the Japanese Journal of Metals snobbish? No, sir! Inserted in the latest issue are illustrated postcards made directly from some of those handsome and costly paintings in our last Annual Number (Jan. 3 issue).

We are flattered, but it would have been a nice gesture to print on the cards, "From The Iron Age."

He Couldn't Say No

A MARION, Ind., manufacturer, with only recently developed powers of resistance, writes:

"We get too many trade journals. In fact, too many to get anything out of them."

The forestry conservation commission ought to get after the man who loads himself with papers he doesn't use. He can't do much about those that come in unbidden, but he can pick and choose among those he pays for.

Incidentally, of the 5,186 Iron Age subscribers whose subscriptions expired in the second half of 1934, 4,253 rechose The Iron Age. The figures by months are:

		Expirations	*Renewals*
July,	1934	645	518
August	"	725	550
September	"	702	570
October	"	753	623
November	"	674	550
December	"	1,687	1,442
	Totals	5,186	4,253

December is the last month on which we can now report, as renewals are counted for a period of six months after expiration. Better than 82% renewals is the reason why Iron Age editors' vest buttons are wired on.

Insomnia-Promoter

HERE is Bakelite's Don Masson's brain-crusher:

"A king who desired to select an intelligent prime minister told three candidates to stand with their backs to each other. He said, 'I'm going to put a red or blue cross on each forehead. Then you can face each other. As soon as you see a red cross, put your hand up. As soon as you know what your own color is, put your hand down.'

"The king then put a red cross on each forehead. The men faced each other. Immediately all three hands went up. After a moment's thought one man lowered his hand. How did he know the cross on his own forehead was red?"

Laurels to Lukens and Helpers

A FOUR-ORCHID bouquet to the advertisers, artist, editors and Lukens (the order is alphabetical) for those two striking inserts in the July 4 Iron Age. Hang on to your copy. You might get a price for it. Demand has exhausted the supply. We had to pass up an order for 200 copies.

Harry Johnson, who drew those pictures you yearn to frame, is an Iron Age alumnus—an unusually able artist who, oddly, acts like a regular human being.

They Didn't Say Yes, They Didn't Say No

THE curiosity of *Time* and others was aroused by the item that appeared here about electroplating corpses. We were asked for particulars, but our subscriber, the Liberty Electroplating Co., Los Angeles, developer of the process answers our inquiry with silence.

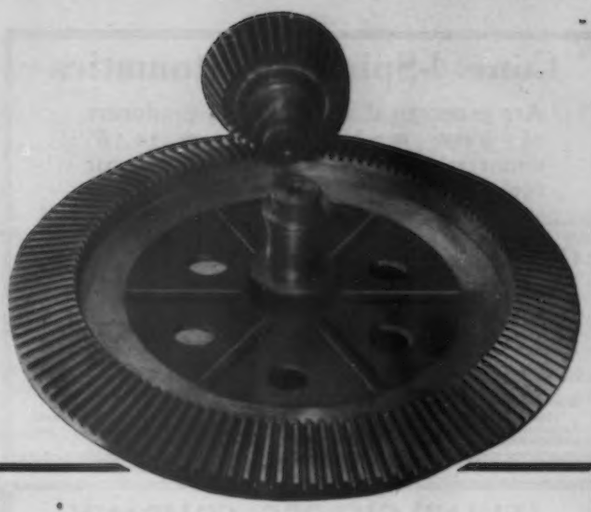
The Los Angeles *Times* reports that Coroner Nance saw a demonstration and says, "The plated corpse appeared like a statue. Every feature had been faithfully preserved. We were told the process 'seals' the body hermetically and that it would remain lifelike for hundreds of years."

Omnivorous Arkansan

IRON AGE subscribers make animal traps, operating tables, machines for making tinsel, macaroni and doughnuts, bird cages and other specialized products. The specialization record is held by the Clarksville Welding & Machine Works, Clarksville, Ark., which builds machines for making staves, not for rye, not for Bacardi, not for wine, but for Bourbon.

We are told by a third party that John Cline, owner of that business, "eats up The Iron Age every week." If Mr. Cline tells us he does no such thing, we will publish a retraction here.

—A. H. D.



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No matter what type of gear you need (or what size or material either), you can send to Philadelphia for it. We've specialized in gears of all types for nearly 50 years, and our stock of hobs and patterns is now so large that we can give you just what you want and, further, we'll give it to you when you want it. Our 48 page "Gear Book" is full of information needed by gear buyers. We'd be glad to send you a copy. Just write for it.

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Cone 4-Spindle Automatics

Are economical and accurate producers of screw machine parts up to 6" diameter, 7" milling length. They cut costs, increase production, boost profits.

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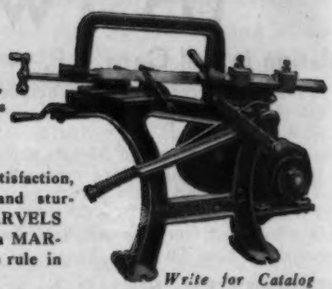
New England: Potter & Johnston Machine Co., Pawtucket, R. I.
Indiana: G. A. Richey, Chamber of Commerce Bldg., Indianapolis, Ind.
New York State: Syracuse Supply Co., Syracuse, N. Y.; also Rochester, N. Y.
Pennsylvania: Arch Machinery Co., 1005 Park Bldg., Pittsburgh, Pa.
Philadelphia: Lloyd & Arms, Inc., 133 South 36th St., Philadelphia, Pa.
California: C. F. Bulotti Machinery Co., 829-831 Folsom St., San Francisco, Calif.

80% *are* MARVELS



. . . . of all dry cutting, general purpose hack saws *in use* today, more than 80% are MARVELS.

Complete customer satisfaction, simplicity, compactness, and sturdier construction keep MARVELS working . . . earning. Pick a MARVEL every time. It's a safe rule in metal sawing.

Write for Catalog

ARMSTRONG-BLUM MFG. CO., "The Hack Saw People"
349 N. Francisco Ave. CHICAGO, U. S. A.

LELAND-GIFFORD COMPANY

Worcester, Mass.
Drilling Machinery
Belt and Motor Spindle
One to Six Spindles
Tapping Attachments and Multiple Heads

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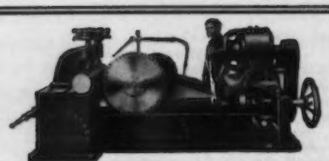

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